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Evolution of opportunities for early childhood development in Arab countries

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Introduction

The present technical study draws upon a report detailing conditions for early childhood development (ECD) across the Arab region, using the newest waves of national health surveys (Hlasny and Intini, 2015). While Hlasny and Intini discuss the state of children's opportunities in Arab countries at a particular point in time, focusing on static comparisons across countries, the present report emphasizes the intertemporal evolution of opportunities within countries. The typical level of opportunities and inequality in opportunities across various socioeconomic groups are reviewed, to assess the nature of progress. Where appropriate, analysis of conditions before and after the events of the Arab uprisings is provided. To these ends, 17 national surveys are added to the 20 surveys already included in Hlasny and Intini's study. Surveys from that study are combined with those from El-Kogali and Krafft (2015), as well as with four unique new surveys (Egypt, 2015; Mauritania, 2011; Somalia, 2011; Sudan, 2010), to bolster evidence and intertemporal comparisons, particularly for countries that have not been adequately studied to date. Several indicators of children's opportunities are recalculated from the previous studies to facilitate comparability over time.

This report contributes to the review of ECD opportunities in the Arab region by expanding historical coverage and putting existing knowledge of ECD opportunities in perspective for longer-term trends. By combining country-level results across multiple survey waves, including waves evaluated by El-Kogali and Krafft, this study identifies new patterns regarding evolution of ECD opportunities in the Arab region during recent years. As a byproduct, by focusing on intertemporal rather than cross-sectional comparison of surveys, this study is less susceptible to limitations in cross-survey harmonization. By evaluating multiple waves for each country, this study is less open to sample-specific sampling or measurement errors. This can offer a new perspective on the findings of previous studies.

In addition to these innovations, the same estimation methods, definitions of outcome indicators and explanatory variables employed by El-Kogali and Krafft, and Hlasny and Intini are used in this study. We also present the same set of ECD indicators and follow a similar style of presentation of results. The findings are thus complementary and comparable to those reports.[1]

The study is organized as follows. Section II describes the available data and outlines the approach taken in the empirical analysis. Section III presents main results, and discusses what they reveal about ECD opportunities across countries, across socioeconomic groups, and over time. Section IV sets out the conclusions and recommendations.

I. DATA AND METHODS: BRIEF REVIEW

The present study uses a set of 37 standardized population and health surveys from 14 Arab countries, encompassing records from around 450,000 households, 500,000 eligible women, 370,000 children and 260,000 live births. These surveys are taken from the UNICEF-coordinated Multiple Indicator Cluster Surveys (MICS), the USAID-coordinated Demographic and Health Surveys (DHS) and the Pan-Arab Project for Family Health (PAPFAM) Surveys. The surveys cover a variety of indicators on maternal care during pregnancy and delivery, and of young children's health, nutrition, engagement in cognitive-developmental activities and pre-primary education.

Sixteen Arab countries are included in the analysis, namely Algeria, the Comoros, Djibouti, Egypt, Iraq, Jordan, Lebanon, Libya, Mauritania, Morocco, Palestine, Somalia, the Sudan, the Syrian Arb Republic, Tunisia and Yemen. For 14 of these countries (all but the Comoros and Libya), information is available for multiple years, adding up to 37 surveys in total and allowing evaluation of ECD opportunities over time. In particular, seven surveys come from years following the 2011 Arab uprisings. We can evaluate children's living circumstances before and after the Arab uprisings for Egypt (surveys for 2005, 2008, 2014 and 2015), Jordan

[1] However, because statistical models in the three studies occasionally use different samples and account for different sets of variables, caution must be taken when comparing predicted values.

(survey for 2007, 2009 and 2012) and Yemen (surveys for 2003, 2006 and 2013). We may similarly evaluate evolution of children's opportunities in countries that have avoided domestic unrest, including the Comoros (survey for 2012), Djibouti (surveys for 2006 and 2012) and Palestine (surveys for 2004, 2006, 2010 and 2014). Tables A1 and A2 in the annex I to the present study show basic statistics for all included surveys.

Early childhood development is evaluated using a number of indicators on qualified care for mothers during pregnancy and child delivery, as well as children's access to minimum nutrition, health, parental care and developmental activities. These can be broadly classified as related to children's health, nutrition, and engagement in cognitive developmental activities, in line with the coverage of basic opportunities in the Human Opportunity Index of the World Bank and a component of the definition of human development in the United Nations Human Development Index.

Opportunities for ECD are evaluated across socioeconomic groups within each country. Children's access to various ECD opportunities is summarized in the estimated human opportunity index (HOI), which measures children's access to developmental activities across households. The overall inequality in opportunities is broken down to estimate the role of individual drivers of inequality in ECD opportunities in each country.

The annexes to the present study indicate additional results, namely children's propensity to engage in ECD activities among the poorest versus the wealthiest one-fifth of households, and among the least advantaged versus the most advantaged households, according to multiple socioeconomic criteria. Finally, the annexes highlight the degree of overall inequality (dissimilarity index) in the propensity to engage in ECD activities across all socioeconomic groups, as defined by households' socioeconomic characteristics.

A. ECD indicators and children's background

ECD indicators evaluated in this report come under three broad categories: young children's access to health, nutrition and cognitive-development activities. Health indicators include mothers' prenatal and delivery care by trained attendants; adequate (four or more) health-centre visits during pregnancy; children's full immunization (for tuberculosis, diphtheria, whooping cough, tetanus, polio and measles) by age 1; and neonatal and infant mortality (in the first month and first year of life, respectively). Nutrition indicators include children's access to adequately iodized salt at home, and children's anthropometric standing (stunting – low height for age; underweight – low weight for age; and wastage – low weight for height). Access to cognitive-development activities in early childhood is measured using children's enrolment in institutional pre-primary education (early childhood care and education (ECCE) at 3-4 years; and early childhood education (ECE) at 5-6 years); engagement in a variety of developmental interactions with family members (reading books, singing or telling stories, playing indoors or outside, looking at picture books and naming objects, or spending time with children); suffering violent verbal or physical disciplining at home; and engagement in domestic chores or other work. Children's stunting, underweight and wastage, and the corresponding anthropometric ratios, are evaluated over time to track children's development from birth to the age of 5.[2]

Among explanatory variables, we account for households' wealth; educational achievements by mothers, fathers or household heads; household's residence in rural versus urban areas; residence in administrative regions; and sex of the child and of the household head. Wealth is measured by the population quintile into which a household falls, imputed from the asset index of durable goods (McKenzie, 2005).

B. Estimation method

Applying a method initially proposed by Roemer (1998), and following the approach taken by El-Kogali and Krafft (2015), we use probit regressions to estimate the effects of various household circumstances on the propensity of children to engage in various opportunities for early childhood development. A HOI

[2] For justification of ECD indicators, technical details of their construction and sample selection for each indicator, please consult Hlasny and Intini (2015). Methods and variable definitions are also discussed in detail in that study.

for each dimension of ECD is then computed.[3] To understand the impact of each household characteristic on children's access to ECD, Shorrocks-Shapley decomposition is used and normalized Shapley values in percentage form are estimated. These can be interpreted as fractions of inequality explainable by observable household characteristics.

As a byproduct, estimated probit coefficients are used to predict access to the various dimensions of ECD for children in hypothetical least advantaged versus most advantaged circumstances. To measure inequality of opportunity for ECD, a dissimilarity index for binary-outcome variables is also estimated (Barros and others, 2008). These additional results are presented in the annexes.[4]

II. RESULTS

The following tables show the status of children's access to ECD opportunities and its evolution over time across the Arab region. Table 1 shows access rates to various ECD opportunities in each country and year. Table 2 shows the coverage in access to ECD opportunities, accounting for inequality across households, expressed by HOI. Table 3 shows results of the decomposition of inequality according to contributions by households' various socioeconomic characteristics.

A. Opportunities and inequality in ECD across Arab countries

Table 1 shows the typical access rate to ECD opportunities. Prenatal and delivery care is evaluated among women who have given birth in the past two years. The remaining indicators are evaluated among children or live births. The most striking observation in table 1 – although one that is not of central focus in this study – is that the values of ECD indicators are generally poor by worldwide standards and differ vastly across individual countries.

The bottom row of table 1 shows access rates to ECD opportunities across the Arab region, taking into account country size and the ranges of ECD access rates as reported by El-Kogali and Krafft (2015). Access to ECD opportunities is generally poor across the Arab region, with an average of only 60 per cent of women benefiting from adequate prenatal doctor visits, 53 per cent of children being fully vaccinated, and 49 per cent of children having access to iodized salt. Children's health outcomes correspond to these inadequate opportunities: 2.8 per cent die before their first birthday, 22 per cent are stunted, and 12 per cent are significantly underweight. With respect to cognitive development, only 50 per cent of children engage in adequate developmental activities at home, and only 27 per cent of 3-4 year-olds and 24 per cent of 5-6 year-olds attend formal preschool programmes. In addition to poor involvement in learning activities, 87 per cent of children are subject to violent disciplining, and 26 per cent are asked to perform work within or outside the home, which is believed to negatively affect children's emotional and cognitive development.

Overall, numbers in table 1 are quite consistent with those in previous studies, falling for the most part within the ranges identified by El-Kogali and Krafft (2015) and Hlasny and Intini (2015), with only a handful of exceptions (pregnancy care in Mauritania, Somalia and the Sudan; children underweight and wasting in Palestine; nursery enrolment in Lebanon; child labour in Egypt and Somalia) where the ranges in this study markedly exceed those in El-Kogali and Krafft's sample.

[3] For indicators of lack of ECD opportunity (including child mortality, inadequate physical growth, violent disciplining and child labour), we compute HOI by accounting for unequal access to the corresponding positive opportunity (i.e., survival, healthy physical growth, childhood free of disciplining or forced labour).

[4] Estimation was performed in Stata programme. HOI and the dissimilarity index were computed using the *hoi* automatic do-file programme (Azevedo and others, 2010). The Shorrocks-Shapley decomposition was performed using Caroline Krafft's programme *shapley3*, Version 1.0 3.21.13, based on Chavez-Juarez's (2014) *shapley2*. Standardization of children's anthropometric measurements relative to a reference population with a healthy median and variance was done using the *zscore06* programme in Stata (Leroy, 2011). This programme compares children's measurements to the WHO 2006 global child growth standards (Onis and others, 2006).

ECD access rates differ vastly across countries. Measures of women's care during pregnancy and child delivery, as well as children's physical growth potential and access to health, parental care and developmental activities vary significantly across the 16 countries. Palestine has the highest rates of women's care, among the lowest rates of adverse health outcomes among children in terms of mortality and under-growth, and the best infrastructure for child development in terms of preschool education programmes. Access to vaccination and iodized salt for Palestinian children is among the highest in the Arab region. These trends have existed since the 2004 wave of the DHS survey and further improved in 2010 and 2014, specifically for prenatal and delivery care and child mortality, while some indicators stagnated, such as access to iodized salt, early childhood education and violent disciplining.

On the other end of the spectrum of ECD opportunities across the Arab region, Somalia and Yemen have some of the lowest rates of women's care and the highest rates of child mortality, stunting and underweight. Somali children have the poorest access to iodized salt and vaccinations in the region. Somalia also has one of the lowest availability of formal preschool education, and very high prevalence of child labour. While child mortality and the rate of child labour have fallen over time, access to vaccination and nursery and preschool programmes has stagnated or worsened. These conditions, combined with one of the poorest availability of primary and higher education (Cummings and van Tonningen, 2003) suggest that Somali children face dismal opportunities with respect to their cognitive development, and Somali and Yemeni children face grave risks with respect to their physical health.

Opportunities for ECD have for the most part improved over time, as table 1 suggest.[5] In two-thirds of ECD indicators for which observations are available for multiple years, access of the general population to ECD improved over the years. Opportunities diminished over time in only one-third of such indicators. Improvements were particularly widespread – in terms of the share of countries – for child mortality, rates of stunting, underweight and wasting, enrolment in nurseries, and violent disciplining. However, situations changed for the worse most systematically regarding children's access to vaccination, iodized salt and preschool education, where opportunities diminished in half or more of all countries. Algeria, Egypt, Jordan, Palestine and Tunisia saw improvements across the vast majority of ECD indicators, while Djibouti, Lebanon, Morocco, Somalia and the Sudan saw deteriorations in half or more of the evaluated indicators.[6]

For countries and indicators with three or four observations over time – many indicators for Egypt, Jordan, Palestine and Yemen – improvements are for the most part monotonic. This should be expected, so finding it helps to verify accuracy of results. Notable exceptions to monotonicity are children's anthropometrics, which could be due to short-term spells of famine or to factors affecting single cohorts of children that drifted in and out of the sampling frame.

Several indicators for Palestine also dipped in 2006 or 2010. This may be due to escalations in the Israeli-Palestinian conflict and the Israeli blockade preceding 2010, or by high item non-response in the 2010 survey wave. Concerning reports that neonatal and infant mortality in Palestine recently rose, from 1.20 per cent to 2.03 per cent, and from 2.02 per cent to 2.24 per cent, respectively, over the period 2008-2013, table 1 shows a different story, namely that both forms of mortality dropped sharply after 2006 and slid further between 2010 and 2014.

The magnitude of changes observed over time is typically a 1-5 percentage point improvement in access to ECD among all women or children, across all countries and indicators (a mean of 2 percentage point improvement). There are 25 country-indicator cases where access improved by ten percentage points or more of all women (including six indicators for Egypt 2008-2014; four for Tunisia 2006-2011; and two for Algeria

[5] Colour highlighting is used for clarity. Lighter green indicates an improvement, while darker red indicates deterioration. Changes in access rates of less than 0.1 percentage points are ignored.

[6] Admittedly, some of these counts for countries (with multiple observations for an indicator) or for indicators (with multiple observations for a country) are quite small, so inference to other countries or indicators is questionable. Trends can reliably be described only for indicators (countries) with a full set of countries (indicators) with multiple observations across years.

2002-2006, Iraq 2006-2011, Palestine 2010-2014, Syrian Arab Republic 2006-2009 and Yemen 2006-2013), and 13 cases where access deteriorated by 10 percentage points of all women or more (including three indicators for Palestine 2006-2010; and two for the Syrian Arab Republic 2006-2009 and Mauritania 2007-2011).

These findings have various implications. Among the sample of countries and time periods in this study, ECD opportunities improved most systematically and robustly in Algeria (2002-2006), Egypt (2008-2014), Iraq (2006-2011) and Tunisia (2006-2011). While the improvement in Egypt was continual during 2005-2015, a bulk of it took place during 2008-2014 on both the extensive and the intensive margin. While this was the period around the Egyptian revolution, we cannot tell whether the improvement took place before or after the revolution, or indeed whether there was a causal link between the political and socioeconomic events. In Mauritania (2007-2011), the Syrian Arab Republic (2006-2009) and Palestine (2006-2010), most of children's opportunities improved slightly, but two or three dimensions of ECD significantly deteriorated, calling into question progress in these countries. Particularly, Palestine over the periods 2004-2006 and 2010-2014 saw gradual systematic improvements along most dimensions of ECD opportunities. From 2006 to 2010, however, four ECD indicators significantly worsened (medical assistance with child delivery, access to iodized salt, enrolment in nurseries, and children's engagement in household labour) while the rest stagnated or improved only modestly.

Lastly, for countries with three or more observations over time, we can comment on the precision of estimates in a year using estimates from surrounding years. For Egypt (2005-2008, 2008-2014 and 2014-2015), Jordan (2007-2009 and 2009-2012), Palestine (2004-2006, 2006-2010 and 2010-2014) and Yemen (2003-2006 and 2006-2013), we did not observe significant volatility in the sense that a large change would be followed by a large change in the opposite direction. However, in Egypt and Palestine we observed unexpected development for some indicators. In Egypt, the rate of stunting increased markedly in 2008 followed by an equal fall in the following period (from a prevalence rate of 17.6 per cent, through 28.9 per cent to 17.6 per cent). Since the surprising value for 2008 was reported by El Kogali and Krafft (2015) and verified by Hlasny and Intini (2015), we can suspect the quality of the original sampling conducted in 2008 but not the post-survey estimation work.

Similarly, in Palestine, the rates of medical care during delivery, salt iodization and enrolment in nurseries unexpectedly deteriorated in 2006-2010. One explanation may be the situation facing Palestinian residents on the ground. Starting in 2006, Gaza came under an economic blockade that restricted the movement of resources and residents. This blockade was further tightened in 2007. Israel also initiated military offensives in Gaza that escalated into a 22-day war over the winter of 2008-2009. During this period of economic hardship and outright destruction of infrastructure and lives, foreign assistance fell short of what was needed or what had been pledged (ESCWA, 2016). Another possible explanation for the inconsistent figures in 2006, 2010 and 2014 lies in the different survey design between PAPFAM 2006, and MICS 2010 and 2014, and DHS 2004. These surveys use different wording for relevant questions and different population sampling weights. DHS (2004) also covered a smaller sample. Since El Kogali and Krafft's book relied only on PAPFAM (2006) data, our analysis contributes new perspective on the situation in Palestine using two newer waves of MICS surveys.

B. Inequality in ECD opportunities within countries and its dimensions

Table 2 supplements the findings in table 1 by reporting the corresponding human opportunity index (HOI) essentially discounted for within-country heterogeneity in ECD opportunities. These HOIs uniformly suggest worse conditions than the average prevalence rates in table 1 (lower for indicators of positive opportunities or outcomes, and higher for indicators of negative outcomes), implying that all indicators are subject to nontrivial heterogeneity within all countries, and that there are children who face less ample opportunities for development than a typical child in their country.[7] An improvement in an HOI for an indicator in a country

[7] Tables A3 and A4 in the annex elaborate on this claim by reporting the range of ECD prevalence rates among the poorest one-fifth versus the wealthiest one-fifth of households in each country (table A3), and among the least advantaged versus the most

may arise from an improvement in the typical rate of access, or from the levelling of that access rate across socioeconomic groups – the typical access rate increased or became more equal.

HOIs for three-quarters of all indicators and countries improved over time (rose for positive opportunities or outcomes, and fell for negative outcomes), and HOIs for only one quarter of indicators and countries deteriorated. This is a more positive finding than in table 1, suggesting that, besides the raising of opportunities for all, the levelling of opportunities across socioeconomic groups plays a part. Comparing the numbers (and colouring) in table 1 and table 2 suggests that access to iodized salt in Iraq and the Sudan, access to preschool programmes in Palestine and Somalia, and rates of underweight and wasting in the Syrian Arab Republic and Tunisia improved over time, when we give sufficient weight to the levelling of these opportunities across socioeconomic groups. On the other hand, while the average rates of underweight and wasting in Djibouti and Mauritania improved over time, the increase in inequality in them across socioeconomic groups led the corresponding HOIs to deteriorate.[8]

Across more than half of all countries and ECD indicators for which intertemporal data are available, within-country inequality in access to ECD fell. This is particularly true for women's adequate access to physicians during pregnancy and delivery, rate of wasting among children, and access to iodized salt. On the other hand, the evolution was uneven with regard to children's access to immunization and cognitive development at home and in preschool programmes, as well as children's stunting, underweight and mortality rates. For these measures of ECD, intergroup inequality fell in some countries but rose in others. Across most Arab countries evaluated here, intergroup inequality increased for violent disciplining of children.

Intergroup inequality in access to most forms of ECD fell in Egypt and Tunisia. In Iraq, Jordan and Yemen, inequality fell for the majority of ECD indicators, but also rose for a substantial number of indicators. Algeria, Djibouti, Morocco and the Syrian Arab Republic, at the end of the spectrum, saw increases in inequality for half or more of the evaluated ECD indicators. These changes in inequality cannot be explained by differences in the starting levels of inequality across countries and ECD indicators. Measures of ECD with high starting values of intergroup inequality – including child mortality, salt iodization, and admission to nurseries and pre-school programmes – saw only slightly better results in terms of improved equality of access than other forms of ECD. Countries with high starting levels of inequality fare no better than countries with low initial inequality in terms of improvement over time.

Sizes of intertemporal changes observed in table 2 are similar, if not slightly larger, than those observed in table 1. This suggests that any perceptions of improvements in access to ECD opportunities in the Arab region come mostly from improvements in typical access rates rather than from significant diminution of inequality in access rates across socioeconomic groups. Given that changes in table 2 are slightly higher than those in table 2, this suggests that inequality in access rates generally falls over time, improving HOI, but the effect is weak compared to that of the changes in average access rates. Table A5 confirms that the dissimilarity index has fallen for as many ECD indicator-country cases as the cases it has increased for, and the decreases are as large in magnitude as the increases, resulting in no meaningful reduction in overall inequality.

Intertemporal changes in table 2 imply improvements of 1-5 percentage points in access rates across most ECD opportunities (a mean of 2 percentage-point improvement), as measured by HOI, accounting for inequality in these access rates. There are 28 cases where an indicator in a country improved and 15 cases where an indicator retreated from a better level, by ten percentage points or more. The most systematic and largest improvements were observed in Egypt (2008-2014), Tunisia (2006-2011) and Yemen (2006-2013), while Mauritania (2007-2011) and Palestine (2006-2010) witnessed large deteriorations in several dimensions of ECD. Development

advantaged children (table A4). Table A5 shows the dissimilarity index corresponding with the prevalence rates in table 1 and HOIs in table 2.

[8] Tables A3 and A4 support these conjectures: the ranges of the rates of underweight and wasting between the poorest fifth and the richest fifth, and between the least versus the most advantaged children, widened over time, significantly so in Djibouti. The dissimilarity index in table A5 correspondingly rose.

was mixed in Djibouti (2006-2012), the Sudan (2006-2010) and the Syrian Arab Republic (2006-2009), where several indicators improved by a large margin but others also deteriorated by a large margin.

Table 3 elaborates on the individual contribution of various household characteristics to the disparity in children's opportunities. The dissimilarity in prevalence rates of ECD opportunities (reported in table A5) is decomposed according to the contributions of individual socioeconomic characteristics and circumstances, namely household wealth, mother and father's education, rural versus urban residence, and administrative region. Estimates in table 3 can be interpreted as fractions of the dissimilarity in ECD opportunities across households with different characteristics that can be attributed to each of these characteristics. While these contributions should not be interpreted as causal, they can be viewed as proxies for different dimensions of inequality brought about by different sets of factors, including the observed household characteristics as well as unobserved factors associated with them. For example, the estimated effect of household wealth may reflect the sum of causal contributions of the availability of family resources, public infrastructure and community resources, social capital and access to information, among others.

Estimates in table 3 represent the fractions of the observed dissimilarity in an ECD opportunity in each country attributable to particular characteristics, rather than their effects in absolute terms. The aim is to contrast the relative role of various household characteristics, and to facilitate such comparison across countries, years and indicators. Figures in table 3 indicate which vectors are most responsible for the continuation of inequality and should be equalized to bring about more equal access to ECD opportunities.[9]

Heterogeneity in household wealth accounts for 20-30 per cent (typically 25 per cent) of inequality in ECD opportunities across most countries and ECD indicators. Mother's education accounts for 15-25 per cent (typically 19 per cent) across most countries and ECD indicators. Father's education accounts for a somewhat lower fraction, at 10-20 per cent (typically 14 per cent) of inequality. Rural versus urban residence accounts for 5-15 per cent (typically 11 per cent). Lastly, systematic differences across administrative regions account for 20-35 per cent of inequality (typically 30 per cent). This serves to verify that household wealth (or factors associated with it) plays a significant role – but by no means an all-important role – in driving inequality in children's access to ECD opportunities within Arab countries. Importantly, the degree of overall inequality varies greatly across countries and ECD indicators, and somewhat across years.

Contribution of wealth and other socioeconomic background characteristics differs substantially across countries and types of ECD opportunities. Availability of prenatal care, iodized salt and developmental activities with parents or in preschool programmes appears to be highly associated with household wealth, since 30 per cent of disparity in these ECD opportunities is due to wealth whereas only 13-17 per cent of the disparity in neonatal mortality and child labour is estimated to be driven by household wealth differences. The role of wealth in driving inequality is higher in Algeria, Djibouti, Mauritania and Yemen, and lower in Jordan (2007-2009), Libya, Palestine (2004-2010) and the Syrian Arab Republic.

For other socioeconomic determinants, the trends are different. Mother's education appears to affect ECD opportunities most significantly in Algeria, Jordan and Lebanon, where it drives disparities in medical care during pregnancy and delivery, and in infant mortality. The role of mother's education is lowest in Djibouti and Morocco, across all ECD indicators. Across ECD opportunities, mother's education seems to explain the disparities in prenatal and delivery care, child mortality, stunting and nursery attendance, but does not explain access to iodized salt and subjection to violent disciplining and child labour.

[9] Countries with less inequality produce lower estimates of the contributions of household characteristics in absolute terms compared with countries with more inequality, while they may yield similar estimates of their relative importance. This is useful if we want to know the relative importance of wealth versus parental education, for example, to the persistence of inequality or to the struggle to eliminate inequality. Estimates in table 3 can be multiplied by dissimilarity indices reported in table A5 to understand the effects in absolute terms.

Father's education has a modest influence across ECD opportunities in Algeria and Lebanon, but a much lower influence in Mauritania, Morocco and the Sudan. It explains nearly 20 per cent of inequality in child mortality and the rate of underweight, but only 10-15 per cent of inequality in other ECD indicators. Rural residence appears to affect ECD opportunities noticeably in Morocco, where it contributes 20 per cent of the dissimilarity across social groups, particularly for medical care for mothers, infant mortality and children's enrolment in nurseries and preschool. It contributes very little in Jordan, Palestine (2010-2014), the Sudan and the Syrian Arab Republic. Across all countries, whether households reside in rural areas affects particularly the disparities in cognitive development at home and nursery and preschool attendance, suggesting that access to education and the culture of home-based instruction are inadequate in rural areas. Surprisingly, rural residence does not appear to contribute to children's physical stature or disciplining practices at home, suggesting that access to nutrition and cultural factors within households may be similar in cities.

Lastly, administrative region of residence appears to exert the greatest influence over ECD opportunities in Djibouti, Egypt, Jordan (2007-2009), Libya, Mauritania, the Sudan and the Syrian Arab Republic (of 30-40 per cent), and only slightly less so in other countries (20-25 per cent). Across ECD indicators, regional differences appear to have significant bearing on the prevalence of children's immunization, physical stature, access to iodized salt, violent disciplining and child labour, and less so on child mortality, cognitive development at home and enrolment in nurseries and preschool.

Over time, wealth is estimated to command somewhat weaker influence on inequality of ECD opportunities relative to other background characteristics. In over half of indicator-country cases, a decrease in the Shapley value for wealth was observed over time. Moreover, over half of these decreases were by 10 percentage points or more – particularly in Egypt (2008-2014), Iran (2006-2011) and Mauritania (2007-2011), and especially for rates of vaccination, underweight and violent disciplining. Similarly, father's education and rural/urban residence diminished slightly in importance over time relative to other characteristics, particularly in Algeria (2002-2006) regarding father's education; and in Iraq (2006-2011), Mauritania (2007-2011) and Palestine (2006-2010) for prenatal and delivery care in the case of rural/urban residence. Instances of falling values, and those falling by 10 or more percentage points, outnumbered those of comparable increases.

On the other hand, mother's education and administrative region rose slightly in relative importance over time across all indicator-country cases. The relative contribution of mother's education rose especially in Egypt (2008-2015), Jordan (2007-2009), Palestine (2010-2014), Somalia (2006-2011) and Yemen (2006-2013). The relative importance of administrative regions rose over time in Iraq (2006-2011), Mauritania (2007-2011) and the Syrian Arab Republic (2006-2009), while it decreased systematically in Jordan (2007-2012) and Palestine (2010-2014). The relative importance of regions notably rose regarding inequality in access to prenatal care, immunization and engagement in child labour, while showing diverging trends across countries for other ECD indicators.

Table 1. Intertemporal comparison of ECD indicators (children or women with access to ECD, initial–final wave %)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. activities	ECCE3 -4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Algeria 2002-2006	79.2-89.4	52.5-55.8	94.4-95.2	91.8-89.2	0.7-.	1.0-.	23.2-12.4	11.0-4.1	10.6-3.9	61.0-58.4	.-61.7	.-8.9	.-23.9	.-86.2	.-22.2
Comoros 2012	92.4	57.4	83.8	63.7	2.1	3.3	29.6	15.6	11.1	91.0	.	.	.	.	25.0
Djibouti 2006-2012	92.3-87.9	.-26.6	92.9-87.4	45.7-20.6	.-3.6	.-6.0	32.6-33.5	30.3-29.9	30.1-22.3	0.4-.	26.5-35.8	14.1-.	6.4-.	69.6-36.2	18.6-.
Egypt 2005-2008-2014-2015	69.8-73.6-90.2-.	59.2-66.5-82.7-.	74.6-79.0-91.6-.	81.7-91.7-34.2-.	1.9-1.6-1.4-.	3.1-2.4-2.3-.	17.6-28.9-17.6-13.5	6.1-6.0-6.8-1.8	3.8-7.3-7.6-1.5	72.6-75.4-88.3-.	.	31.6-33.4-58.6-50.6	10.7-.-.-.	97.0-.-94.9-.	24.3-.-45.5-.
Iraq 2006-2011	78.9-77.7	67.8-50.8	59.8-90.8	50.6-64.3	2.2-2.0	3.3-3.1	23.8-21.7	8.2-6.9	6.0-6.4	24.9-24.4	44.4-53.5	2.5-3.8	4.1-7.2	86.2-77.2	13.4-10.1
Jordan 2007-2009-2012	98.8-.-99.1	94.2-.-94.5	99.0-.-99.6	86.7-.-93.0	1.5-1.4-1.5	2.1-2.1-1.8	14.4-8.0-7.6	5.3-1.8-3.0	7.2-1.5-2.4	.	.-.-81.6	.-.-21.7	.	.-.-91.5	.
Lebanon 2004-2006	95.4-95.4	.-84.9	98.2-93.9	51.5-47.6	1.0-.	1.5-.	18.1-.	5.2-.	6.6-.	89.9-88.8	.	92.9-96.4	.	.	.
Libya 2007	93.8	75.5	98.7	85.8	1.1	1.7	21.0	5.6	7.0	52.5	.	5.3	.	.	7.1
Mauritania 2007-2011	73.9-33.7	.-17.4	57.9-29.0	36.5-31.9	.	.	26.9-25.3	30.4-28.3	13.3-13.2	1.6-7.9	36.1-.	7.2-.	.	.	.
Morocco 2004-2006-2011	67.9-.-77.6	30.6-.-41.8	62.9-.-23.3	89.6-.-51.9	2.5-.-.	3.8-.-.	23.1-.-.	9.9-.-.	11.6-.-.	.-19.6-.	.-58.0-34.8	.-40.2-.	.-42.4-.	.-95.8-.	.-19.4-.
Palestine 2004-2006-2010-2014	98.4-98.5-98.6-99.4	86.4-90.4-94.3-96.0	91.6-97.7-68.1-99.6	94.5-85.9-92.7-87.3	2.3-2.1-1.3-1.0	4.0-3.0-2.0-1.7	11.0-11.9-10.9-7.4	6.1-2.3-3.7-1.4	3.4-2.0 - 3.3-1.2	68.2-87.7-79.5-73.8	.-68.3-66.6-79.0	.-34.1-17.7-26.9	71.1-.-94.3-90.0	.-95.4-92.3-94.1	.-15.3-31.4-.
Somalia 2006-2011	.-35.1	.-26.6	.-37.6	9.7-6.8	3.8-2.8	8.4-4.9	38.1-.	36.3-.	11.8-.	1.5-.	65.0-62.4	2.3-2.3	13.6-12.2	.-71.7	52.1-29.1
Sudan 2006-2010	60.0-52.0	38.9-48.5	62.1-17.1	27.9-44.2	.-2.9	.-5.0	.-34.2	.-29.4	.-15.2	11.4-10.3	.	.-20.4	.-30.1	.	.
Syrian Arab Republic 2006-2009	83.3-87.7	.-69.2	91.4-96.3	34.9-54.4	.-1.2	.-1.7	25.1-25.8	11.0-11.2	10.4-11.8	.-30.4	59.8-48.3	7.4-11.2	44.1-32.9	85.7-58.1	12.3-3.3
Tunisia 2006-2011	53.0-98.1	65.2-85.5	.-98.6	85.5-89.6	.-1.2	.-1.7	6.4-10.1	3.4-2.3	2.8-2.8	.	53.8-71.1	27.3-44.5	.-88.5	98.5-94.9	.-24.0
Yemen 2003-2006-2013	44.4-47.0-61.0	31.6-.-25.3	28.8-35.7-43.6	37.2-40.7-43.5	2.2-4.0-2.5	4.6-7.1-4.0	53.1-.-46.3	45.6-.-38.9	12.4-.-16.4	.-.-49.0	.-25.5-.	.-2.7-.	.	.-93.2-80.0	.-15.8-.

Table 1 (*continued*)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. activities	ECCE3 -4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Wghtd avg.[a]	78.8	60.4	70.9	52.9	1.8	2.8	21.8	11.8	7.5	48.5	50.3	26.7	24.3	86.6	26.2
range (min-max)	33.7-99.4	17.4-96.0	17.1-99.6	6.8-94.5	0.7-4.0	1.0-8.4	6.4-53.1	1.4-45.6	1.2-30.1	0.4-91.0	25.5-81.6	2.3-96.4	4.1-94.3	36.2-98.5	3.3-52.1
El-Kogali & Krafft sample (min-max)	47.0-99.1	30.6-94.5[b]	35.7-99.6	30.7-93.0	1.0-4.0	1.5-7.1	7.6-53.1	6.9-45.6[b]	6.4-22.3[b]	0.4-87.7	25.5-81.6	2.7-40.2	6.0-89.0[b]	36.2-95.5	7.0-24.0

Legend: Initial–Intermediate(s)–Final. Light green background indicates improvement of values over time; darker red indicates worsening. When information from 3+ waves shows a non-monotonic trend, comparison of the first wave and the last wave is used. "." Unavailable due to missing data or small sample sizes.

[a] Average of countries' most recent waves for which the indicator is available, weighted by estimated 2015 population size (UNDESA, 2015) to represent approximately the ECD access rates across the Arab region in recent years. [b] In a subsample of 5-6 countries where the indicator is available.

Table 2. HOI across ECD Indicators and intertemporal comparison (initial–final wave HOI, %)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. Activities	ECCE3 -4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Algeria 2002-2006	73.2-85.3	47.1-48.0	92.2-92.8	89.3-86.8	0.8-.	1.5-.	25.4-14.2	12.6-5.0	11.6-4.5	.-50.7	.-57.3	.-5.9	.-16.7	.-88.7	.-23.6
Comoros '12	90.4	50.5	78.3	54.6	2.9	4.3	34.1	18.5	12.6	89.3	.	.	.	.	28.7
Djibouti 2006-2012	90.2-81.9	.-23.3	90.1-78.9	41.8-17.6	.	.	36.6-36.8	33.8-33.9	32.8-25.0	.	22.2-30.9	9.4-.	3.9-.	73.4-40.7	23.1-.
Egypt 2005-2008-2014-2015	61.4-67.0-87.3-.	49.5-58.4-78.2-.	66.5-71.9-88.5-.	79.6-90.1-31.7-.	2.2-2.1-1.7-.	3.7-2.9-2.7-.	19.8-31.5-19.6-15.8	7.1-6.7-7.8-2.4	4.5-8.2-8.3-2.1	64.8-69.2-84.7-.	.	23.5-25.3-49.7-43.9	7.1-.-.-.	97.7-.-95.9-.	27.2-.-50.4-.
Iraq 2006-2011	72.6-72.5	57.7-45.7	53.6-88.2	43.7-58.9	2.4-2.2	3.5-3.3	26.0-23.4	8.8-7.5	6.4-6.9	19.5-19.5	39.7-46.7	1.5-2.2	2.4-4.0[a]	90.4-79.5	15.1-12.0
Jordan 2007-2009-2012	98.1-.-98.7	92.8-.-92.8	98.6-.-99.4	83.3-.-90.9	2.1-1.9-1.8	2.6-2.6-2.2	17.1-9.5-9.5	6.7-2.4-3.8	8.6-2.1-3.0	.	.-.-78.9	.-.-16.4	.	.-.-94.6	.
Lebanon 2004-2006	.-93.3	.-79.9	.-91.4	.-40.2	.	.	22.1-.	6.3-.	8.1-.	87.4-86.1	.	89.7-95.1	.	.	.
Libya '07	91.93	71.53	97.87	83.17	1.36	2.14	22.07	6.21	7.67	44.06	.	3.78	.	.	8.82
Mauritania 2007-2011	70.6-28.2	.-13.6	48.3-22.5	32.6-26.4	.	.	29.5-28.9	34.9-33.2	15.4-15.6	1.1-5.9	32.0-.	4.9-.	.	.	.
Morocco 2004-2006-2011	58.2-.-68.7	22.5-.-31.1	50.7-.-18.0	86.4-.-48.1	3.0-.-.	4.6-.-.	26.9-.-.	12.4-.-.	14.6-.-.	.-13.3-.	.-40.6-27.1	.-25.5-.	.-28.6-.	.-97.7-.	.-24.2-.
Palestine 2004-2006-2010-2014	97.9-98.0-98.3-99.2	82.6-88.2-93.0-95.2	88.7-97.0-65.1-99.4	93.1-83.6-90.6-84.4	2.5-.-1.4-1.4	4.5-.-2.2-2.3	11.9-13.5-12.0-8.2	6.9-2.5-4.1-1.7	4.0-2.2-3.7-1.5	62.7-86.8-73.8-70.1	.-65.1-62.5-75.8	.-29.9-15.0-22.9	67.1-.-92.8-87.6	.-96.3-93.5-95.4	.-17.6-36.5-.
Somalia 2006-2011	.-26.0	.-20.1	.-26.1	5.3-5.0	4.3-0.8	9.0-1.6	44.5-.	42.8-.	14.0-.	1.0-.	62.5-57.9	1.3-1.3	0.7-9.2	.-80.4	57.3-31.6
Sudan 2006-2010	48.9-42.2	29.9-40.1	52.7-10.0	19.1-37.2	.-2.5	.-4.6	.-29.3	.-33.8	.-16.7	4.6-4.7	.	.-13.8	.-20.0	.	.
Syrian Arab Republic 2006-2009	77.7-83.3	.-63.6	87.5-94.2	32.3-49.7	.	.	28.3-29.1	12.7-12.6	11.9-13.1	.-20.7	53.6-41.5	4.6-6.6	41.7-29.5	89.3-67.6	13.8-4.3
Tunisia 2006-2011	43.1-97.1	58.6-81.5	.-97.5	81.4-85.7	.-1.7	.-2.3	8.1-12.1	4.8-3.0	3.7-3.4	.	44.3-62.7	17.9-33.1	.-82.9	99.4-96.1	.-29.3

Table 2 (*continued*)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. Activities	ECCE3 -4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Yemen 2003-2006-2013	36.7-39.1-52.1	23.6-.-17.2	22.9-26.4-33.6	27.5-32.4-37.2	2.6-4.7-3.0	5.1-8.2-4.6	.-.-52.0	.-.-18.4	.-.-44.1	.-.-40.5	.-20.6-.	.-1.2-.	.	.-95.7-82.0	.-19.9-.
Wghtd. avg.[a]	73.5	54.0	66.6	48.8	2.0	3.2	22.9	12.2	12.2	42.3	43.3	33.4	16.5	89.1	29.7
Range (min-max)	5.7-99.2	13.6-95.2	10.0-99.4	5.0-93.1	0.8-29.1	1.5-12.7	8.1-52.0	1.7-42.8	1.5-53.6	1.0-89.3	20.6-78.9	1.2-95.1	0.7-92.8	40.7-99.4	8.8-57.3

Legend: Initial–ontermediate(s)–final. Light green background indicates improvement of values over time; darker red indicates worsening. Among 3+ waves, comparison of the first and the last wave is used. "." unavailable due to missing data, small sample sizes, missing covariates, or perfect collinearity or perfect prediction of outcomes among covariates. For negative indicators (mortality, inadequate physical growth, disciplining and child labour), HOI for the corresponding opportunity is used: $HOI = 1 - (1 - \widetilde{D})\bar{\widetilde{p}}$ where tildes are for the corresponding positive ECD opportunities, and lower HOI are preferred.

[a] Average of countries' most recent waves for which indicator is available, weighted by estimated 2015 population size (DESA, 2015).

Table 3. Decomposition of inequality in ECD opportunities: contribution of selected background characteristics – wealth (normalized Shapley value, %)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. Activities	ECCE3-4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Algeria 2002- 2006	21.3-25.8	26.3-24.1	20.9-22.1	28.1-28.1	13.5-.	41.4-.	51.5-32.1	58.4-18.9	30.4-22.3	.-26.9	.-34.3	.-32.4	.-31.8	.-2.8	.-23.8
Comoros 2012	21.3	16.7	26.4	21.6	3.5	3.2	19.1	12.6	13.7	64.5	.	.	.	.	33.1
Djibouti 2006-2012	22.3-23.8	.-29.2	30.4-30.1	30.6-43.8	.	.	36.8-51.3	20.3-37.6	10.0-31.2	.	44.0-13.2	21.3-.	30.5-.	34.1-32.8	35.4-.
Egypt 2005-2008-2014-2015	26.8-34.1-25.3-.	31.8-35.9-27.9-.	8.9-33.9-8.8-.	18.9-21.3-11.2-.	10.4-17.9-13.5-.	11.7-31.7-20.9-.	20.7-4.5-4.9-25.5	13.4-15.6-16.9-15.2	23.6-18.6-26.0-34.7	38.9-44.2-39.3-.	.	38.8-33.7-16.8-27.4	43.1-.-.-.	33.2-.-32.3-.	32.7-.-20.1-.
Iraq 2006-2011	37.2-30.6	37.3-33.1	43.1-37.4	18.4-23.9	18.6-3.8	16.1-20.7	19.7-10.6	31.3-6.8	22.0-7.9	19.5-22.5	40.9-37.2	35.3-33.5	32.6-16.7	36.2-22.9	11.8-8.4
Jordan 2007-2009-2012	16.9-.-31.5	14.4-.-44.1	10.0-.-38.2	5.6-.-28.5	19.2-7.0-41.5	12.6-5.4-31.2	6.7-32.4-28.9	41.8-16.4-28.7	3.5-13.2-34.8	.	.-.-22.9	.-.-38.2	.	.-.-33.5	.
Lebanon 2004-2006	24.0-39.3	.-21.5	.-27.8	50.4-22.5	.	.	21.4-.	28.6-.	6.3-.	25.2-29.5	.	10.7-50.9	.	.	.
Libya 2007	21.8	26.4	2.3	27.1	19.2	20.3	33.7	10.1	16.8	6.3	.	18.8	.	.	8.3
Mauritania 2007-2011	46.1-6.3	.-28.7	37.2-14.8	28.7-9.0	.	.	28.9-38.0	32.1-33.6	45.0-23.2	35.0-14.0	18.3-.	27.5-.	.	.	.
Morocco 2004-2006-2011	27.7-.-30.6	27.3-.-34.5	29.5-.-14.4	31.2-.-26.2	20.9-.-.	29.7-.-.	39.3-.-.	20.8-.-.	5.5-.-.	.-22.2-.	.-29.2-25.6	.-34.8-.	.-31.9-.	.-20.7-.	.-15.5-.
Palestine 2004-2006-2010-2014	19.0-21.5-24.7-42.8	5.1-31.8-24.6-23.2	1.3-6.1-10.2-32.6	13.8-22.4-13.3-52.5	29.9-.-30.6-13.5	19.0-.-46.8-5.9	11.3-17.8-51.0-8.3	26.2-32.4-41.6-14.4	16.1-29.0-29.5-27.4	3.9-4.6-3.0-18.2	.- 53.7-40.3-41.1	.- 32.0-52.6-36.7	38.4-.-28.4-23.1	.- 23.2-10.6-30.3	.-8.0-13.1-.
Somalia 2006-2011	.-33.2	.-13.1	.-43.1	19.4-22.4	43.5-10.2	27.6-4.2	27.2-.	40.1-.	21.8-.	40.0-.	11.1-24.8	22.7-30.7	33.0-39.2	.-5.3	16.5-23.2
Sudan 2006-2010	23.5-29.9	31.5-28.5	29.9-38.2	32.5-23.3	.-5.2	.-6.6	.-28.5	.-34.2	.-18.4	17.0-13.6	.	.-30.0	.-45.7	.	.
Syrian Arab Republic 2006-2009	18.5-16.5	.-27.0	34.5-21.5	33.2-14.1	.	.	10.3-12.6	15.9-8.9	11.5-5.5	.-15.1	15.1-36.3	24.4-23.8	9.3-21.7	20.0-4.9	9.1-9.6
Tunisia 2006-2011	31.4-33.8	25.8-24.2	.-24.3	27.0-13.6	.-8.5	.-19.5	20.9-25.8	29.3-19.4	14.0-3.6	.	21.8-27.8	25.5-29.0	.-33.8	14.3-16.5	.-16.3
Yemen 2003-2006-2013	31.3-28.5-30.6	34.9-.-39.6	14.0-42.3-36.4	35.4-32.5-29.2	9.2-24.8-17.1	13.9-30.1-36.7	.-55.5-36.7	.-.-41.7	.-.-24.6	.-.-30.0	.-29.1-.	.-30.4-.	.	.-29.8-22.6	.-11.9-.
Wght. Avg.[a]	27.8	29.2	23.3	21.0	12.9	23.3	26.8	20.9	20.5	27.2	31.2	41.8	35.0	21.1	16.7

Legend: Initial–intermediate(s)–final. Light green background indicates improvement of values over time; darker red indicates worsening. Among 3+ waves, comparison of the first and the last wave is used. Reported numbers are the Shapley decomposition values in percentage form – percentages of the differences in access to ECD opportunities across socioeconomic groups that can be attributed to individual socioeconomic characteristics – normalized to add up to 100% across the evaluated characteristics. "." unavailable due to missing data, small sample sizes, missing covariates, or perfect collinearity or perfect prediction of outcomes among covariates.

[a] Average of countries' most recent waves for which indicator is available, weighted by estimated 2015 population size (UNDESA, 2015).

Table 3 (*continued*)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. Activities	ECCE3-4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Algeria 2002-2006	37.0-32.3	36.6.-35.8	29.9-23.6	41.7-32.6	34.0-.	17.4-.	.-24.9	.-17.8	.-4.9	.-25.8	.-19.6	.-26.1	.-28.3	.-2.6	.-15.9
Comoros 2012	32.8	24.8	24.0	12.8	18.7	21.9	20.0	29.7	31.7	.	.	.	.	.	.
Djibouti 2006-2012	6.7-5.4	.-13.2	3.8-4.5	19.3-2.1	.	.	10.5-1.7	5.1-2.2	2.4-1.1	.	12.7-5.1	21.3-.	25.0-.	33.2-0.9	6.1-.
Egypt 2005-2008-2014-2015	32.6-28.1-31.9-.	27.5-23.9-31.5-.	36.1-21.5-36.5-.	22.6-11.3-11.6-.	24.9-28.4-28.9-.	37.7-17.9-29.2-.	10.2-4.0-16.9-31.6	13.2-.-15.2-21.6	24.2-.-12.0-18.1	7.9-13.1-6.5-.	.	4.8-23.8-12.9-37.4	5.1-.-.-.	9.7-.-7.5-.	8.8-.-16.4-.
Iraq 2006-2011	6.0-23.6	6.9-21.6	8.0-18.1	23.1-17.0	13.5-10.8	37.2-13.0	20.9-10.8	38.4-11.7	26.4-14.0	9.5-9.7	20.2-24.2	22.0-21.1	15.4-7.9	11.8-8.9	3.4-15.5
Jordan 2007-2009-2012	31.1-.-27.7	30.0-.-26.3	45.2-.-26.6	13.6-.-29.7	24.3-39.3-15.5	27.8-34.5-20.3	14.3-28.8-24.3	16.5-49.0-30.4	11.1-26.1-30.4	.	.-.-37.5	.-.-39.6	.	.-.-14.3	.
Lebanon 2004-2006	46.3-35.8	.-44.9	.-46.3	14.8-22.5	.	.	24.9-.	37.7-.	19.4-.	45.2-31.4	.	35.2-.	.	.	.
Libya 2007	48.5	40.7	17.7	34.0	11.7	14.9	9.7	15.8	5.1	4.8	.	16.1	.	.	10.0
Mauritania 2007-2011	8.7-37.3	.-33.8	9.3-39.3	15.0-5.7	.	.	12.6-9.1	12.7-10.9	11.5-6.6	18.4-5.6	12.7-.	25.5-.	.	.	.
Morocco 2004-2006- 2011	20.5-.-19.8	23.0-.-18.7	18.1-.-8.0	12.6-.-10.5	14.6-.-.	18.8-.-.	10.9-.-.	8.0-.-.	3.1-.-.	.-4.6-.	.-9.2-19.8	.-8.1-.	.-9.0-.	.-6.8-.	.-16.3-.
Palestine 2004-2006-2010-2014	14.8-23.9-23.9-4.3	6.5-13.8-29.8-15.0	6.5-5.2-10.8-5.1	43.4-3.8-2.0-3.7	26.9-.-3.1-81.2	43.6-.-8.2-88.2	30.3-11.2-19.5-42.7	17.7-11.7-7.6-44.9	13.2-7.2-9.4-2.5	1.9-5.1-2.6-0.1	.-27.1-14.3-13.8	.-41.8-27.0-26.3	23.1-.-9.4-24.4	.-16.2-6.9-3.6	.-8.8-6.2-.
Somalia 2006-2011	.-9.1	.-2.1	.-7.6	2.7-20.9	18.6-56.5	26.5-62.5	7.5-.	7.8-.	2.6-.	12.5-.	3.7-6.7	7.8-5.5	12.9-12.6	.-7.4	17.8-4.4
Sudan 2006-2010	13.9-14.2	23.0-16.4	29.6-6.7	13.4-22.4	.-88.0	.-88.3	.-25.9	.-17.8	.-10.9	3.5-1.0	.	.-29.7	.- 5.7	.	.
Syrian Arab Republic 2006-2009	29.5-23.8	.-20.0	21.1-25.1	32.4-23.4	.	.	23.6-18.3	19.8-22.2	12.0-7.8	.-12.7	22.6-16.5	29.5-35.5	26.7-.	15.0-.	15.2-3.0
Tunisia 2006-2011	19.9-1.1	24.7-22.4	.-10.5	5.9-20.1	.-6.6	.-7.0	18.1-10.3	18.1-17.8	11.6-11.0	.	17.1-19.3	20.9-8.7	.-9.5	12.1-12.3	.-12.7
Yemen 2003-2006-2013	21.3-23.5-19.6	18.3-.-18.9	15.4-12.0-22.4	13.9-28.6-10.9	17.1-5.0-19.4	10.4-3.2-13.7	.-.-16.8	.-.-14.9	.-.-5.1	.-.-11.0	.-28.6-.	.-11.4-.	.	.-12.1-13.3	.-22.3-.
Wght. Avg.[a]	24.5	25.0	22.2	17.8	32.9	31.7	21.5	17.7	11.1	9.6	21.1	21.2	11.4	8.3	14.9

Legend: Initial–intermediate(s)–final. Light green background indicates improvement of values over time; darker red ndicates worsening. Among 3+ waves, comparison of the first and the last wave is used. Reported numbers are the Shapley decomposition values in percentage form – percentages of the differences in access to ECD opportunities across socioeconomic groups that can be attributed to individual socioeconomic characteristics – normalized to add up to 100% across the evaluated characteristics. "." unavailable due to missing data, small sample sizes, missing covariates, or perfect collinearity or perfect prediction of outcomes among covariates.

[a] Average of countries' most recent waves for which indicator is available, weighted by estimated 2015 population size (UNDESA, 2015).

Table 3 (*continued*)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. Activities	ECCE3-4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Algeria 2002- 2006	26.4-25.3	22.0-18.8	25.3-22.7	22.3-24.1	22.3-.	36.0-.	38.4-23.0	29.9-16.0	60.0-13.0	.-13.5	.-16.4	.-16.2	.-18.4	.-16.8	.-33.3
Comoros 2012	27.0	13.6	8.3	11.0	24.0	23.5	16.5	10.4	24.9	.	.	.	.	.	.
Djibouti 2006-2012	11.0-8.5	.-5.8	11.4-9.5	16.1-18.6	.	.	22.4-0.8	8.5-0.7	9.3-0.6	.	24.6-3.6	32.5-.	27.5-.	18.6-1.0	22.4-.
Egypt 2005-2008-2014	9.8-13.7-13.1	9.4-11.9-12.1	13.3-7.6-11.0	11.7-8.1-18.2	20.6-2.6-27.9	26.0-6.7-15.3	4.6-6.6-9.5	12.6-14.7-40.7	14.5-23.0-9.3	10.4-11.4-15.4	.	3.9-10.3-3.6	5.4-.-.	31.9-.-7.7	7.2-.-17.2
Iraq 2006-2011	15.8-16.7	15.0-14.2	8.1-15.2	15.4-12.9	11.0-.	12.8-.	3.7-15.5	12.1-8.3	13.6-5.3	2.5-4.0	16.6-20.9	19.7-17.0	5.9-5.3	28.9-20.3	2.0-2.0
Jordan 2007-2012	24.3-28.8	18.5-14.0	22.3-29.8	10.0-9.7	16.5-20.0	9.1-32.2	8.4-13.1	9.1-27.8	5.2-14.0	.	.-22.2	.-14.5	.	.-21.5	.
Lebanon 2004-2006	29.7-22.5	.-32.1	.-22.1	34.8-53.7	.	.	14.4-.	6.5-.	23.5-.	18.6-24.2	.	47.7-42.0	.	.	.
Libya 2007	27.5	21.2	12.6	15.0	13.3	20.6	17.2	13.3	1.7	4.6	.	20.0	.	.	10.8
Mauritania 2007-2011	7.2-2.7	.-3.4	4.3-4.3	2.1-13.7	.	.	7.0-8.4	8.7-6.4	5.5-4.2	7.2-9.0	4.1-.	10.2-.	.	.	.
Morocco 2004-2006-2011	12.1-.-14.6	15.0-.-15.7	13.9-.-5.7	13.0-.-11.3	11.2-.-.	5.2-.-.	11.0-.-.	6.0-.-.	2.2-.-.	.-2.4-.	.-9.3-13.8	.-3.7-.	.-7.3-.	.-10.7-.	.-10.3-.
Palestine 2004-2006-2010-2014	11.5-17.5-35.5-41.2	10.7-6.5-19.6-39.0	3.0-6.9-9.4-57.2	29.6-9.6-0.6-6.3	19.8-.-.-.	22.0-.-.-.	41.0-5.2-6.2-28.3	31.1-24.5-36.7-25.6	10.0-3.8-24.1-14.2	1.6-38.7-9.3-10.9	.- 16.0-5.0-9.0	.- 20.9-13.5-22.9	7.6-.-3.8-28.0	.- 8.9-20.8-27.2	.- 10.8-1.3-.
Somalia 2006-2011	.-13.9	.-6.2	.-10.0	7.3-6.2	.-23.9	.-22.9	7.2-.	10.5-.	14.4-.	33.0-.	11.2-20.1	24.3-10.1	15.0-15.3	.-14.2	25.4-6.2
Sudan 2006-2010	10.7-12.4	17.7-17.4	15.2-11.5	10.1-8.4	.-1.5	.-2.0	.-8.2	.-7.8	.-4.4	0.0-0.7	.	.-7.9	.-14.9	.	.
Syria 2006-2009	6.2-6.5	.-9.5	6.8-7.2	9.7-9.9	.	.	11.2-5.2	10.3-7.6	10.0-9.8	.-2.6	20.4-9.5	25.1-17.1	12.2-13.9	14.7-2.3	14.8-15.1
Tunisia 2006-2011	9.9-10.3	11.4-9.9	.-2.3	28.0-8.2	.-40.0	.-43.7	20.0-23.0	19.4-14.6	9.4-21.6	.	13.5-9.8	8.2-7.3	.-10.9	24.3-50.2	.-6.2
Yemen 2006- 2013	10.8-13.6-8.3	6.1-.-6.7	5.5-3.3-6.5	18.8-6.7-22.9	11.5-.-14.4	41.7-.-13.5	.-.-6.5	.-.-8.0	.-.-7.5	.-.-4.8	.-11.2-.	.-3.4-.	.	.-29.1-13.3	.-19.8-.
Wght.Avg.[a]	15.2	14.1	12.6	15.8	18.4	16.6	12.2	18.5	8.7	9.4	15.0	12.0	10.3	13.4	15.5

Legend: Initial–intermediate(s)–final. Light green background indicates improvement of values over time; darker red indicates worsening. Among 3+ waves, comparison of the first and the last wave is used. Reported numbers are the Shapley decomposition values in percentage form – percentages of the differences in access to ECD opportunities across socioeconomic groups that can be attributed to individual socioeconomic characteristics – normalized to add up to 100% across the evaluated characteristics. "." unavailable due to missing data, small sample sizes, missing covariates, or perfect collinearity or perfect prediction of outcomes among covariates. Partner's education is used in models of prenatal and delivery care, and child mortality. Father's education is used in models of immunization, stunting, salt-iodization, child development, education, disciplining and child labour. Education of the household head (regardless of their sex) is used when partner's and father's education is unavailable. In Jordan '09 and Egypt '15, father's/partner's/head's education is unavailable.

[a] Average of countries' most recent waves for which indicator is available, weighted by estimated 2015 population size (UNDESA, 2015).

Table 3 (*continued*)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. Activities	ECCE3-4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Algeria 2002-2006	15.4-14.5	15.2-12.6	23.9-15.4	6.6-8.4	8.0-.	3.7-.	2.6-4.9	3.0-4.8	2.3-6.9	.-7.6	.-12.4	.-9.5	.-16.0	.-0.3	.-7.0
Comoros 2012	7.4	1.1	13.1	0.7	13.4	17.0	2.7	5.4	9.8	0.9	.	.	.	.	16.4
Djibouti 2006-2012	31.4-27.9	.-15.8	30.4-37.0	4.9-2.8	.	.	2.2-24.4	6.1-22.1	6.6-15.3	.	4.3-7.8	3.5-.	3.1-.	6.1-29.1	0.7-.
Egypt 2005-2008-2014-2015	9.7-8.0-4.3-.	10.9-9.5-5.6-.	15.8-10.1-12.5-.	3.7-2.2-23.4-.	3.7-5.1-1.1-.	1.4-3.7-6.1-.	3.1-4.2-0.4-3.4	1.4-0.9-1.3-.	8.5-6.9-3.9-.	20.8-5.4-15.1-.	.	11.0-4.9-0.8-3.1	13.1-.-.-.	1.6-.-12.7-.	9.2-.-16.4-.
Iraq 2006-2011	38.8-23.7	39.9-16.9	37.6-25.6	15.4-23.2	8.8-6.2	8.0-3.6	17.0-7.8	14.5-2.5	1.6-1.2	14.1-16.0	21.6-15.3	19.6-25.5	25.2-33.5	3.4-4.2	44.9-3.5
Jordan 2007-2009-2012	1.6-.-4.1	7.1-.-7.1	2.7-.-0.2	14.6-.-2.4	0.4-0.3-0.7	0.6-0.2-0.7	6.3-4.1-2.0	1.7-1.5-6.4	1.0-1.6-3.0	.	.-.-3.6	.-.-0.4	.	.-.-11.4	.
Lebanon 2004	.	.	.	.	.	.	38.1	19.5	22.8	4.3	.	0.5	.	.	.
Mauritania 2007-2011	18.4-0.5	.-2.4	27.3-10.8	8.2-12.4	.	.	19.9-7.2	17.9-16.4	12.4-17.9	2.3-14.1	13.5-.	17.6-.	.	.	.
Morocco 2004-2006-2011	36.3-.-22.2	29.5-.-18.1	34.0-.-18.0	15.4-.-16.0	18.7-.-.	29.7-.-.	20.9-.-.	14.4-.-.	2.8-.-.	.-25.5-.	.-22.3-27.2	.-41.1-.	.-37.7-.	.-3.5-.	.-6.0-.
Palestine 2004-2006-2010-2014	13.3-21.6-1.0-6.5	10.6-14.5-6.5-18.6	12.4-5.7-1.0-3.4	2.3-60.5-9.0-5.2	4.3-.-0.5-4.5	4.5-.-0.7-4.9	6.8-10.6-1.8-0.9	12.7-6.7-1.1-0.9	4.5-29.7-12.4-2.3	12.9-46.9-0.1-9.2	.- 1.1-4.3-0.4	.- 1.5-1.6-4.4	9.0-.-7.7-0.3	.- 4.0-7.5-2.6	.-3.9-4.2-.
Somalia 2006-2011	.-20.7	.-4.1	.-27.8	35.5-18.0	.-1.1	.-1.6	10.5-.	22.5-.	27.5-.	9.0-.	3.2-2.6	26.2-20.9	13.8-6.0	.-0.6	2.8-9.1
Sudan 2006-2010	1.8-8.0	10.8-19.6	3.9-13.0	2.0-3.1	.-2.7	.-1.4	.-9.7	.-13.5	.-8.8	7.3-7.5	.	.-16.2	.-14.1	.	.
Syrian Arab Republic 2006-2009	11.5-8.8	.-13.8	15.3-14.2	6.6-3.2	.	.	1.0-2.7	3.0-1.6	1.0-17.6	.-11.7	3.9-7.8	2.5-4.2	2.8-11.7	5.2-0.9	6.2-1.0
Tunisia 2006-2011	8.9-9.6	17.4-6.2	.-19.6	2.1-10.4	.-10.3	.-10.2	10.7-11.3	9.6-4.2	4.5-1.1	.	21.6-25.6	32.4-42.5	.-32.4	1.4-1.5	.-8.7
Yemen 2003-2006-2013	25.5-15.8-10.9	24.0-.-17.8	21.6-20.5-16.0	22.7-19.5-10.6	2.9-2.2-3.0	1.5-3.2-2.9	36.3-.-7.2	.-.-6.2	.-.-3.0	.-.-17.2	.-15.1-.	.-14.7-.	.	.-8.4-1.2	.-1.0-.
Wght. Avg.[a]	11.6	12.4	15.7	14.5	5.4	7.1	8.0	6.6	6.3	13.9	15.1	19.7	19.3	5.8	8.6

Legend: Initial–Intermediate(s)–Final. Light green background indicates improvement of values over time; darker red indicates worsening. Among 3+ waves, comparison of the first and the last wave is used. Reported numbers are the Shapley decomposition values in percentage form – percentages of the differences in access to ECD opportunities across socioeconomic groups that can be attributed to individual socioeconomic characteristics – normalized to add up to 100% across the evaluated characteristics. "." unavailable due to missing data, small sample sizes, missing covariates, or perfect collinearity or perfect prediction of outcomes among covariates.

In Palestine 2006, urban, rural and refugee-camp residences are distinguished. Lebanon 2006 and Libya surveys do not allow us to distinguish urban and rural areas.

[a] Average of countries' most recent waves for which the indicator is available, weighted by estimated 2015 population size (UNDESA, 2015).

Table 3 (*continued*)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. Activities	ECCE3-4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Algeria 2006	2.0	8.6	16.0	6.0	.	.	13.2	42.1	51.5	25.9	17.0	14.7	5.3	75.4	0.1
Comoros 2012	1.5	42.1	27.6	45.9	22.5	4.5	35.2	33.5	8.2	33.7	.	.	.	.	40.7
Djibouti 2006-2012	28.7-34.4	.-36.0	24.0-19.0	26.7-32.6	.	.	20.4-21.0	52.9-33.6	69.1-37.6	.	14.1-70.0	20.9-.	12.1-.	1.0-31.3	31.7-.
Egypt 2005-2008-2014-2015	21.2-13.1-25.3-.	20.4-15.8-23.0-.	25.9-26.1-31.3-.	42.0-53.2-35.3-.	9.0-20.9-22.5-.	16.0-33.0-27.7-.	57.3-70.7-64.5-38.7	41.2-11.2-19.0-62.1	20.6-24.0-54.6-46.4	21.8-16.9-23.6-.	.	41.4-26.5-65.9-30.5	32.5-.-.-.	23.5-.-37.3-.	41.9-.-29.9-.
Iraq 2006-2011	2.1-5.4	1.0-14.3	3.2-3.6	27.6-22.5	1.8-3.4	0.9-6.6	38.3-49.9	2.3-58.0	1.1-67.2	54.4-47.8	0.8-1.7	2.0-2.7	20.8-36.6	17.2-28.9	6.9-54.0
Jordan 2007-2009-2012	19.0-.-0.7	25.8-.-1.2	14.7-.-2.5	56.0-.-17.1	36.6-30.3-0.4	45.0-35.5-1.6	61.9-27.3-17.7	29.4-32.6-5.4	75.3-51.9-7.5	.	.-.-13.0	.-.-7.3	.	.-.-18.3	.
Libya 2007	2.2	11.7	67.3	23.9	37.2	40.1	18.5	44.9	72.1	84.3	.	40.8	.	.	70.8
Mauritania 2007-2011	18.7-44.3	.-26.6	20.8-29.1	41.1-58.2	.	.	29.9-36.7	27.9-32.1	24.7-47.0	28.4-56.2	50.4-.	18.4-.	.	.	.
Morocco 2004-2006-2011	3.3-.-12.6	5.3-.-12.7	4.5-.-53.4	23.6-.-35.5	28.9-.-.	7.5-.-.	15.5-.-.	48.9-.-.	85.7-.-.	.-43.7-.	.-29.2-13.4	.-11.8-.	.-13.3-.	.-56.5-.	.-46.4-.
Palestine 2004-2006-2010-2014	41.3-15.6-15.0-5.4	67.1-33.4-19.5-4.2	76.8-76.1-68.6-1.6	10.3-1.7-71.4-32.4	19.1-.-0.8-0.2	10.8-.-3.8-0.4	7.6-51.7-6.1-9.5	9.2-22.0-4.3-5.9	56.1-30.2-19.5-53.6	79.7-1.1-84.9-55.7	.-1.7-35.7-35.6	.-3.7-5.1-9.1	21.7-.-50.5-23.2	.-46.1-52.4-34.3	.-25.2-75.1-.
Somalia 2006-2011	.-23.1	.-74.4	.-11.6	32.1-32.3	26.9-7.8	12.9-8.3	47.5-.	18.4-.	30.0-.	0.2-.	70.3-43.8	18.8-31.1	25.1-26.9	.-72.4	31.3-46.2
Sudan 2006-2010	48.6-35.5	16.1-18.1	20.7-30.5	40.2-41.9	.-2.1	.-1.7	.-24.3	.-24.3	.-40.7	70.6-76.8	.	.-15.4	.-19.4	.	.
Syrian Arab Republic 2006-2009	34.4-44.4	.-29.7	22.3-32.1	13.9-49.5	.	.	52.3-60.2	36.6-53.0	57.5-47.8	.-57.7	38.1-29.8	17.9-19.3	48.7-51.6	45.1-91.8	42.6-47.3
Tunisia 2006-2011	29.2-45.3	20.4-37.3	.-43.3	35.6-47.7	.-30.3	.-19.3	27.5-25.0	21.3-22.8	58.9-23.7	.	24.2-16.6	11.6-12.2	.-13.3	37.6-19.3	.-49.5
Yemen 2003-2006-2013	11.0-18.6-30.6	16.7-.-17.0	43.5-21.9-18.7	8.5-12.6-15.6	38.8-60.4-14.6	25.8-60.9-26.9	.-.-31.9	.-.-28.5	.-.-43.8	.-.-37.1	.-15.6-.	.-40.1-.	.	.-20.3-47.4	.-39.5-.
Wght. Avg.[a]	21.3	19.9	27.0	30.4	16.0	16.2	31.9	44.5	50.8	40.2	17.2	16.8	25.2	48.7	36.0

Legend: Initial–Intermediate(s)–Final. Light green background indicates improvement of values over time; darker red indicates worsening. Among 3+ waves, comparison of the first and the last wave is used. Reported numbers are the Shapley decomposition values in percentage form – percentages of the differences in access to ECD opportunities across socioeconomic groups that can be attributed to individual socioeconomic characteristics – normalized to add up to 100% across the evaluated characteristics. "." unavailable due to missing data, small sample sizes, missing covariates, or perfect collinearity or perfect prediction of outcomes among covariates. The following administrative regions are accounted for. Algeria 2006: Centre, North and South; Comoros: Moheli, Ndzouani and Ngazidja; Djibouti: Djibouti proper and rest of country; Egypt: six urban/rural upper/lower/frontier regions; Iraq: Kurdistan and rest of country; Jordan: 12 governorates; Libya: Tripolitania, Fezzan and Cirenaica; Mauritania: Coastal, Saharan and Sahelian; Morocco: 15 governorates; Palestine: Gaza and West Bank (West Jerusalem excluded); Somalia: South and rest of country; Sudan: 9 state-groups; Syrian Arab Republic: coastal, eastern, middle, northern and southern regions; Tunisia: 9 regions; Yemen: Aden, Sanaa City, highlands, east, north, south and west. Algeria 2002 and Lebanon surveys do not allow us to distinguish administrative regions.

[a] Average of countries' most recent waves for which the indicator is available, weighted by estimated 2015 population size (UNDESA, 2015).

III. WITHIN-COUNTRY RESULTS FOR ANTHROPOMETRIC INDICATORS

To evaluate children's physical development within each country over time, we evaluate the evolution of children's physical stature – their height for age, weight for age and weight for height – across the first 5 years of their lives. Children's anthropometric measurements are shown as *z*-scores relative to a reference healthy population[10] by children's age in months. This allows us to identify crucial points in time when children's growth is impeded most severely, and when a targeted institutional intervention should be a humanitarian and economic priority. To assess the extent of inequality in children's physical growth between poor and rich households, the typical patterns of children's growth are reported for the bottom and top wealth quintiles. Lastly, for surveys with two or more observations over time, the pattern of evolution of children's stature is compared across survey waves.[11] Figure 1 presents these results for individual countries in separate subfigures.

A. Algeria

In Algeria, in 2002 and 2006, children's height for age is distributed markedly lower than that of the reference healthy population. Weight for age is also distributed slightly lower, while weight for height is distributed higher than the reference population. In fact, children in the bottom wealth quintile have an average weight for height greater than the overall average in the reference healthy population, but this simply reflects the low height and excessive rate of stunting among Algerian children. One positive trend in figure 1.i is that substantial progress occurred between 2002 and 2006: the rate of stunting fell from 23.2 to 12.4 per cent among all children, and the occurrence of underweight fell from 11.0 to 4.1 per cent.

In 2006, the height-for-age ratio fell dramatically in the first year of life among children in the lowest wealth-quintile households. It also fell significantly across all wealth groups in the fourth and fifth years. Correspondingly, as many as 20 per cent of children in the lowest-wealth group are classified as stunted at the ages of 18 months and 54 months (compared with 9 per cent in the highest quintile, and compared with 32 per cent in the lowest quintile in 2002). Children's weight for age starts above that of the reference healthy population at the time of birth, but falls throughout children's first five years of life, particularly among lowest-wealth households during children's first year. Around 8 per cent of children in the lowest quintile are classified as underweight at the age of 54 months (compared with 3 per cent in the highest quintile, and compared with 15 per cent in the lowest quintile in 2002). Rates of stunting, underweight and wasting by children's age, wealth quintile and survey wave are presented in figure A1 in annex I to the present study.

B. Comoros

In the Comoros, children's height for age and weight for age are distributed significantly below what would be expected in the reference healthy population, while weight for height is distributed nearly as high as the reference population. The distribution of height and weight among Comorian children is low, as in Algeria, but here both height and weight are of similar concern. Across wealth quintiles of the population, children's height and weight fall significantly in the first year of their lives. By the age of 18 months, 50 per cent of children in the lowest-wealth group (30 per cent in the highest quintile) are classified as stunted, and the rate remains around 37 per cent (20 per cent in the highest quintile) for the following 36 months. Similarly, the rate of underweight hovers between 18 per cent and 28 per cent among the poorest-quintile children, and between

[10] The numbers shown are the numbers of standard deviations from a reference healthy population relative to the mean in that reference population. Since the reference population is described only by the mean and the standard deviation, the mean is also viewed as the median, or typical stature in the reference healthy population.

[11] We do not follow individual children over time, but we make use of the various month-by-month cohorts of children covered in the surveys. Hence, one-month old children were born shortly before the survey was administered, while 59-month old children were born five years previously. This timing difference can have serious consequences for any identified trends and their interpretation. Armed conflicts, famine or demographic change may affect the long-term health outcomes of a single cohort of children rather than cause a mere short-term dip in the health of all cohorts (at different ages). The following sections provide interpretations as if children were followed over time, but events that may have caused differentials across child cohorts are noted. After presenting the results, brief justification for these interpretations is provided.

8 per cent and 15 per cent in the wealthiest quintile. At 42 months, 28 per cent of children in the poorest quintile and 15 per cent in the highest quintile are officially underweight.

C. Djibouti

In Djibouti, children's height for age, weight for age and weight for height are all distributed well below the reference healthy distributions, in 2006 and 2012. In fact, the distributions in the two years are very similar to each other, indicating that there was essentially no progress over the six years toward healthier distribution of children's stature. Children's access to nutrition and medical care necessary for healthy physical growth apparently did not improve. While the rate of wasting slightly decreased from 25 per cent across all wealth quintiles to 20 per cent (thanks to improvements among the highest wealth quintile), rates of stunting and underweight remained unchanged at nearly 30 per cent. Inadequate height and especially inadequate weight among Djiboutian children remain a persistent concern.

Decomposing the distribution by children's age, we find that height falls significantly in the first 18 months of children's life among the poorest fifth of households, while it falls more gradually among the richest group. By 18 months, 50 per cent of poorest-quintile children and 30 per cent of richest-quintile children are stunted. The conditions then stagnate, and the rates of stunting remain at around 40 per cent and 27 per cent, respectively, for the following three years.

The pattern followed by children's typical weight is equally worrying. Children's weight falls dramatically by 2.5 standard deviations of the reference distribution in the first year of life, for both the poorest and richest wealth quintile, in both 2006 and 2012. In the following four years the numbers stabilize (deteriorating somewhat across children's ages in 2006). In terms of children being officially underweight, these numbers translate into over 50 per cent of children being classified as underweight at the age of 18 months among the poorest households and 20-25 per cent among the richest households in 2006. Numbers for 2012 are only marginally better. By 36 months, the difference between wealth quintiles diminishes, and children in both groups exhibit an underweight rate of 20-33 per cent.

Lastly, weight-for-height results for 2006 indicate that the ratio was not too far below what would be expected in a reference healthy population. By 2012 this trend deteriorated for those aged 12-36 months while improving for ages 36-54 months. Among the poorest quintile, both in 2006 and 2012, 18-60 month-old children were 0.75-1 standard deviations below the healthy distribution mean and approximately 30 per cent were in a state of wasting (20 per cent among the highest quintile). These results jointly suggest that an intervention into conditions affecting Djiboutian children's height and weight is urgently needed in children's first two years, and a follow-up monitoring of children's weight may need to be conducted between the children's third and fifth years of life.

D. Egypt

Across all waves of the Egyptian survey, children's height for age and weight for age are distributed below what would be expected in the reference healthy population, while weight for height is distributed above the reference population. This suggests that the distribution of height and weight among Egyptian children has been low, but their ratio has not raised major concern.

The comparison across survey waves reveals that development over time has been mixed. While the distribution of weight for age improved, to the extent that the 2008, 2014 and 2015 distributions were just below the reference healthy distribution, the distribution of height for age deteriorated. The official stunting rate among children was as high as 38 per cent in the bottom wealth quintile in 2008 (33 per cent in the upper quintile), compared with below 30 per cent in 2005 (20 per cent in the upper quintile). By 2014, the stunting rate fell to 20-27 per cent for both the poorest and the richest quintiles, representing an improvement among poor households but a deterioration among rich households. This corroborates the findings in table 1 and A3 that the nationwide rate of stunting stagnated between 2005 and 2014 at 17.6 per cent, but the inter-quintile

range of stunting shrank from 23.6-14.4 per cent, through 29.5-27.0 per cent to 19.7-19.4 per cent. Nevertheless, by 2015 the overall rate of stunting fell to 13.5 per cent, while the inter-quintile range increased to 16.9-19.4 per cent, or nearly the 2005 range.

Evaluating children's stature across their ages, we find another surprising difference between 2005 and subsequent years. In 2005, children's height and weight growth deteriorated rapidly in the first year of life – particularly in the bottom wealth quintile – and the rate of stunting peaked around the twelfth month, before they improved slightly in the following four years. Over the period 2008-2015, on the other hand, children's growth was deteriorating nearly monotonically during the first 30 months of life – in both the bottom and the top wealth quintile – before stabilizing in the fourth through fifth years. This suggests that nutritional deficiency became a more protracted and more widespread problem among Egyptian children after 2005.[12]

E. Iraq

In Iraq, for 2006 and 2011, children's height for age and weight for age are also distributed below what would be expected in the reference healthy population, while the distribution of weight for height lies above the reference distribution. Average height for age falls dramatically in the first 18 months of life, drastically for the poorest quintile group, and then stagnates at low levels until the age of 5. The trend of weight for age changed between 2006 and 2011. In 2006 it was drastically falling over the first 18 months and then somewhat improved in the following year before it started falling again over the next thirty months. In 2011, it was improving in the first year of children's lives before it started falling at a similar rate to that observed in 2006. Between 2006 and 2011, these trends in height for age and weight for age deteriorated, particularly for the poorest quintile group, and particularly in the third through fifth years of children's lives.

Regarding stunting, its prevalence in 2006 among the highest wealth quintile households fell gradually from 27 per cent in the first year of life to 18 percent in the fifth year (from 22 per cent to 15 per cent in 2011). Among the poorest households, the rate for 2006 jumps from 23 per cent in the first year of life to nearly 30 per cent in year 3, and then retreats to 23 per cent again by the fifth year (from 18 per cent through nearly 30per cent to 21 per cent in 2011).

For the fraction of children who are underweight, the rate peaks around the twelfth month of children's lives – the peak was at 12 per cent of all children in both the poorest and the richest quintile groups in 2006 and the poorest quintile in 2011, and at 7 percent among the richest quintile in 2011. Then these rates retreated to 5-7 per cent of all children by the middle of the fifth year. The rate of wasting declined monotonically for both wealth quintiles and survey waves evaluated here, from around 10 per cent in the first year to around 4 per cent in the fifth year.

F. Jordan

In the three waves of Jordanian surveys,[13] children's height for age is distributed below what would be expected in a reference healthy population. Weight for age is distributed as highly as the reference distribution, and weight for height just above the reference distribution. Across different ages, approximately 8 per cent of children were stunted among the richest households in 2007 (2 per cent in 2009 and 2012), and 20 per cent among the poorest quintile (13 per cent in 2009, and again 20 per cent in 2012). Regarding the prevalence of underweight or wasting, the rates are only slightly above what they would be in the reference distribution –

[12] The fact that the 2005 and 2008 survey waves may cover some of the same children, with the same characteristics and backgrounds, does not appear to explain the phenomenon. Since children who were one year old in 2005 – the age when the rate of stunting was highest in that year – became four years old in 2008, we would expect a peak of stunting around age 4 in 2008. Instead, we observe stagnation or even a slight dip in the rate of stunting among 42-54 month-old children.

[13] The collection of anthropometric measurements in the 2007 Jordanian DHS was marred by major problems that call into question the use of these data or their comparison to other survey waves (Department of Statistics, Jordan, and ICF International, 2008). Results in this section should thus be viewed with caution.

below 5 per cent of children across all ages, wealth groups and survey waves, compared with 2.3 per cent in the reference distribution. Comparing figures for years 2007, 2009 and 2012 reveals that the distribution of children's height and weight, as well as the rates of stunting and underweight, improved modestly from 2007 to 2009 and remained stagnant until 2012.

In 2007 and 2012, the physical stature of Jordanian children deteriorated slightly in the first year of their lives, as the average height for age, weight for age and weight for height generally fell. The stature of children in the bottom quintile deteriorated mildly across the second and third years of life. Both height for age and weight for age fell, and the corresponding rates of stunting and underweight increased relative to the rates in the first year. In the top wealth quintile, on the other hand, height for age and weight for age fell noticeably in the first year of children's lives. This fall may imply problems with maternal nutrition or with quality of complimentary feeding of babies (Krafft, 2015), or may have arisen simply from measurement problems with the 2007 wave and other waves of the Jordanian survey.

G. Lebanon

Lebanese children's average height for age lies below the average of the reference healthy distribution, while their weight for age and weight for height are distributed above the reference. Height for age rises in the first year of children's lives, falls markedly in the second and third years, and rises again modestly in the fourth and fifth years. Weight for age also rises in the first year and then gradually retreats after 18 months. Approximately 20 per cent of children in the bottom wealth quintile are stunted, compared to 15 per cent in the top quintile. The rate of stunting jumps briefly around the third year of life in both wealth groups to 33 per cent and 20 per cent, respectively. The rate of underweight falls in the first three years – most notably in the first year – from 10 per cent in the top quintile and 15 per cent in the bottom quintile to less than 1 per cent and 5 per cent, respectively. This may suggest inadequate care for mothers during pregnancy or inadequate care for newborns in Lebanon in 2003-2004.

H. Libya

Libyan children's height for age has fat tails and is distributed significantly lower than that of a reference healthy population. Children's weight for age is distributed similarly to the reference healthy population. Weight for height is distributed higher than the reference distribution, implying that insufficient body mass is not typically a problem among Libyan children, while stunting may be. However, wide distributions of weight for age and weight for height result in a disproportionally large number of Libyan children officially classified as underweight and wasted – 5.6 per cent and 7.0 per cent, respectively. These rates are marginally higher among children in the poorest quintile of the population. These results jointly suggest that deficiency of growth is a critical problem among Libyan children overall, while deficiency of body mass is a problem only among a small number of children.

The most significant drop in children's height in the bottom quintile occurs in the first 18 months of life (third year in the top quintile). The rate of stunting jumps to 28 per cent among children in the poorest families and rises above 20 per cent among children in the wealthiest families. From there the rates start descending to 15 per cent in the fifth year.

These results have direct implications for welfare policy, in view of the ongoing civil conflict in Libya. Firstly, the results suggest that a nutritional intervention is warranted to promote physical growth among children throughout the country, since the problem of stunting is widespread. Secondly, such a nutritional intervention should be undertaken in the early months of children's lives. Thirdly, nutritional interventions helping children increase their body mass are needed for a minority of children in the bottom tail of the weight distribution. Better identification and targeting of children requiring nutritional supplements are needed.

I. Mauritania

In Mauritania, all three anthropometric indicators in figure 1.ix are shifted below the respective reference healthy distributions. A significant fraction of Mauritanian children have height and weight well below what we would expect in a distribution of a healthy population. The problem is particularly acute for children's weight, leading to an inadequate proportion of weight for height. Looking at a histogram of weight for height reveals that this indicator is distributed relatively narrowly, suggesting that it tends to be the same children who are in the lower tails of the height and weight distributions.

The bulk of the problem arises in the first 18 months of children's lives. Typical height for age falls by nearly one standard deviation relative to the reference distribution across wealth quintiles and survey waves. The rate of stunting jumped from 10 per cent in the top quintile (13-17 per cent in the bottom quintile), in both 2007 and 2011, to 20 per cent (38-45 per cent in the bottom quintile). With respect to weight for age, similarly, prevalence of underweight among children rises from 3-4 percent to 16-20 percent in the richest quintile (10 per cent to 49-58 per cent in the poorest quintile). Lastly, the rate of wasting stagnates between 4 per cent and 8 per cent among the richest quintile, diminishing slightly as children age, but jumps from less than 5 per cent to 29 per cent among the poorest-quintile children in the first eighteen months.

Another period of concern is the third and fourth years of children's lives in the 2007 survey wave, when their height for age dropps and prevalence of stunting rises again to near 45 per cent in the bottom quintile and 25 per cent in the top quintile, without corresponding changes in weight for age.

Comparison of the 2007 and 2011 survey waves reveals that there were no obvious improvements over time in the overall distribution of children's measurements, or in either of the evaluated wealth quintiles. The high numbers of children who appear chronically stunted or underweight represent a great challenge to health workers and policymakers. Concerted effort should be exerted to improve children's access to nutrition and health through the first five years of their lives, particularly during the first 18 months.

J. Morocco

In Morocco, children's typical height for age, weight for age and weight for height are low and worsening steadily across children's ages. Inequalities between the wealthiest and poorest households also increase, as the widening ranges in figure 1.x imply. Among the wealthiest fifth of households, the rate of stunting remains steady at 18 per cent until the fourth year and then declines to 8 per cent. In contrast, among the poorest quintile, the rate of stunting rises from less than 20 per cent among newborns to over 33 per cent in the second to fifth year of life. The rate of underweight among children stays around 4-5 per cent in the wealthiest quintile, while it rises from less than 15 per cent to around 20 per cent in the poorest quintile.

K. Palestine

In all waves of Palestinian surveys, children's height for age is distributed slightly lower than that of the reference healthy population, while weight for age is distributed as high as the reference population (or higher in 2006 and 2014). Consequently, actual distribution of weight for height is above the reference distribution. These trends jointly suggest that the distribution of height among Palestinian children is a bit low.

In all Palestinian survey waves, children's height for age falls dramatically in the first two years of their lives, particularly in the poorest population quintile in 2006 and 2014. Children's weight for age falls substantially in the first year of their lives (especially in 2006 and 2014,particularly among the poorest population quintile). In the 2006-2014 surveys it continues falling mildly during the following four years. Over the period 2006-2014, weight for age declined from relatively high starting values; the decline ends near zero where the mean weight for age is at the mean of the reference healthy distribution. Prevalence of underweight or wasting among Palestinian children is thus not much higher than those in the reference population.

Comparing children's physical stature in 2004-2006 to that in 2010-2014 may shed light on any long-term health effects of the occupation of Palestine. Distribution of height for age in 2006 was lower and more dispersed than in 2010 and 2014. Moreover, 2010 saw deteriorations in most health indicators, including anthropometric measurements. These observations may reflect the fact that food, medications and medical supplies were in short supply in the Palestinian territories around the end of the Second Intifada, and during the blockade and renewed offensives on Gaza.

L. Somalia

In Somalia, children's height for age and weight for age are distributed significantly below and significantly more widely than what would be expected in a reference healthy population. Distribution of weight for height also lies below the reference distribution, but not as much as height for age and weight for age, and not as widely. We conclude that the distribution of both height and weight is low among Somali children, and children's weight is of particular concern. Children with exceptionally low height may be the same as those with exceptionally low weight, giving rise to a narrow distribution of weight for height.

The first two years in children's lives are particularly problematic, with the height of an average child falling by nearly two standard deviations relative to the reference distribution, and weight falling by more than two standard deviations among the poorest quintile of households. By age 2, nearly 60 per cent of children in poor households and 30 per cent of children in rich households are stunted. Moreover, 65 per cent of 2-year olds in poor households and 15 per cent in rich households are underweight. The rate of wasting peaks at 20 per cent at the ages of 2 and 5 among children in poorest-quintile households.

M. Sudan

Children in the Sudan have height and weight typically lower than the reference distribution. Their height falls relative to reference healthy children during the first 30 months of life, and significant differences between the wealthiest and poorest population quintiles appear. The rate of stunting peaks at 55 per cent at age 2 among the poorest quintile, and at 20 per cent among the wealthiest group. The difference in the rate of stunting of 35 percentage points between the wealthiest and poorest households persists until age 5. Similar patterns emerge for the rate of underweight among children. These figures for Somalia and the Sudan point to humanitarian crises on the ground that regional governments and international organizations should urgently address.

N. Syrian Arab Republic

Syrian children's height for age is distributed clearly lower than that of the reference healthy population, while their weight for age is distributed just below the reference distribution. Weight for height of the wealthiest and the poorest quintile groups is distributed higher than the reference distribution suggesting that, while the deficiency of both growth and of body mass is a problem among Syrian children, the former is a more acute problem. Between 2006 and 2009, distributions of height and weight improved among children in both the wealthiest and poorest households. The poorest households made noticeable progress in raising their physical health and approaching the average stature of the richest group.

The most significant drop in both height and weight statistics occurs in the first 18 months of babies' lives. The rate of stunting jumps to 30 per cent among children in the poorest families and 20 per cent among children in the wealthiest families. By their second birthday, 13-15 per cent of children in the poorest families and 7-9 per cent in the wealthiest families are officially underweight.

In 2009, children's height fell in the first two years of life and stagnated afterwards. Starting in the third year, however, the predicted lines for the top and bottom quintiles rose above the 2006 lines by 0.3 standard deviations, indicating improvement in children's welfare. The fact that stunting rates are similar in 2009 and 2006 suggests that the distribution of height is wider in 2009, and there are still many children with height below the benchmark for stunting (2 standard deviations below the reference population mean). The

distribution of children's weight in 2006 versus 2009 shows analogous patterns. In conclusion, while there has been progress between 2006 and 2009, there are many children who have not been helped sufficiently to escape critical stunting and underweight. This issue is particularly acute in the first two years of children's lives. A nutritional intervention in the early months is warranted to help children's grow and reduce infant mortality or life-long consequences.

O. Tunisia

Distribution of children's height and weight in Tunisia is just below those of the reference healthy population, while in 2011 weight for age was distributed above the reference levels. Regardless, a large difference still exists between children in the poorest and the richest quintiles. This difference grows over the children's first 18 months to reach one standard deviation of the reference distribution. While children in wealthy households end up with height and weight at or above the means of the reference distribution, children in poor households end up significantly below the reference mean. One exception is children's weight in 2011, which is just above the reference mean.

Substantial progress was thus achieved between 2006 and 2011 with respect to children's weight. Correspondingly, the prevalence of underweight has fallen among children in the poorest quintile from 6 per cent to 3 per cent. At the same time, no progress was made with respect to children's height, and the height of children in the wealthiest quintile has fallen. Rates of stunting have risen across all wealth quintiles and across most age groups.

Histograms of the distribution of children's height show that the distribution was wider in 2011 than in 2006. Consequently, a greater share of children fall into the left tail representing the stunted population. Distribution of children's weight, on the other hand, rose in 2011 compared with 2006 without becoming wider. Therefore, fewer children were in the underweight category in 2011. Because of these two trends, weight for height is now distributed higher and slightly more widely than the reference distribution, yielding a slightly higher share of children categorized as wasting.

P. Yemen

In Yemen, distributions of children's height for age and weight for age are significantly below those in the reference healthy population, particularly for height for age. Nearly half of all children (46 per cent) are officially classified as stunted, and 39 per cent are classified as underweight. These facts jointly imply that the distribution of children's weight for height is below the reference distribution, with 16.4 per cent of children classified as wasting.

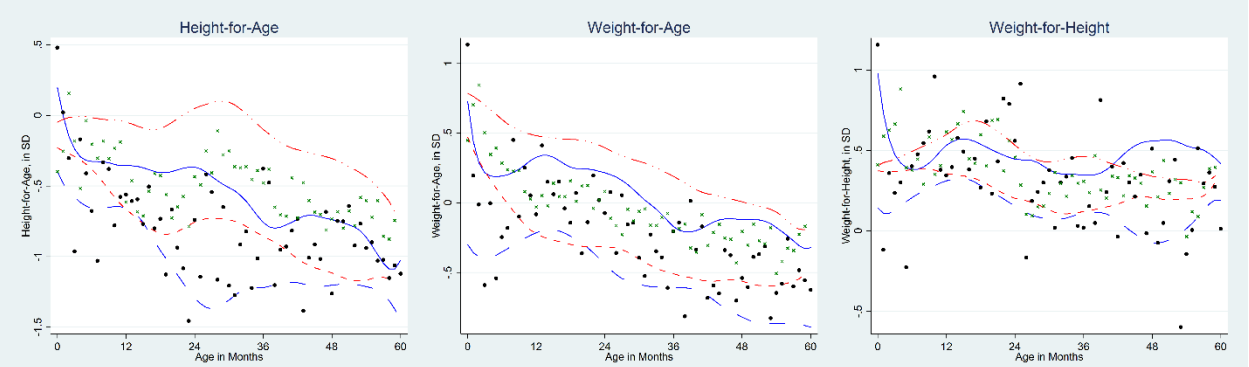
Trends for the poorest and richest population quintiles, and across the first five years of children's lives, show that children's height and weight fall relative to the reference population throughout the first four years of their lives, particularly sharply in the first two years among the bottom wealth quintile. In the fifth year, height and weight stabilize or slightly improve relative to the reference distribution. The rates of stunting and underweight among children in all wealth quintiles peak in the fourth and fifth years of children's lives. Yemeni children thus have a dismal prospect for healthy growth without continual outside assistance and monitoring.

Incidentally, the availability of multiple observations for several countries allows us to evaluate whether the trends across children's ages can be interpreted longitudinally or merely as cohort-specific effects. Similarity in the shapes of the sets of 2-4 lines for each country – Algeria, Djibouti, Egypt, Iraq, Jordan, Mauritania, Palestine, Syrian Arab Republic and Tunisia – suggests that a longitudinal interpretation is possible. Although technically each monthly point represents a different cohort of children, observing quantitatively similar cohort effects in multiple survey waves allows us to infer how children's physical stature develops as they age. In this sense, we can raise concerns about children's development in certain age ranges compared to other age ranges. Across several countries analysed here, this inference yielded a common pattern: children's height and weight deteriorated during the first eighteen months, and then stagnated or mildly improved over the following three

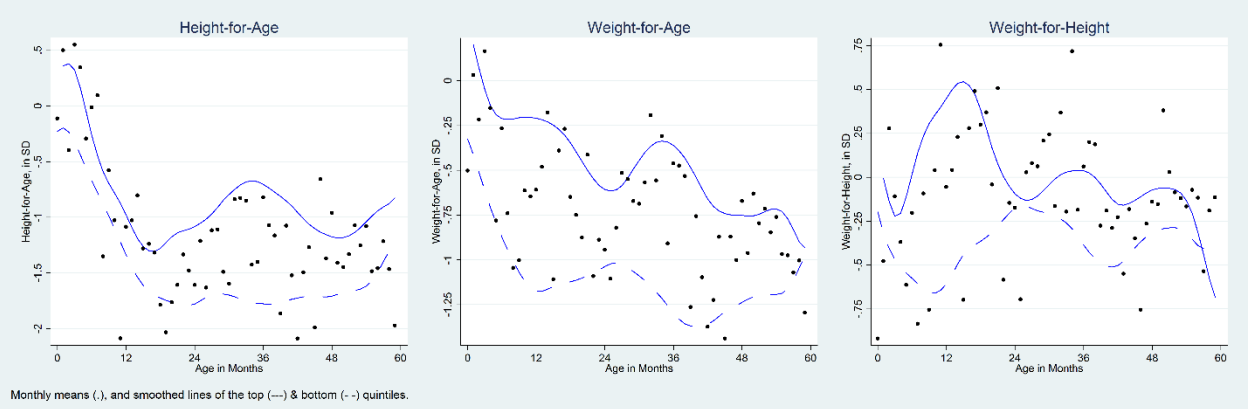
years. While conditions have improved in a number of countries, most countries still have worryingly high numbers of stunted, underweight and wasting children, even in the most recent health survey available. The implication is that, throughout the Arab region, policymakers must pay greater attention to the nutritional and health status of pregnant and breastfeeding mothers, and newborns. Moreover, continuous monitoring of their health in the two years after birth is necessary.

Figure 1 Anthropometric indicators of child development by children's age

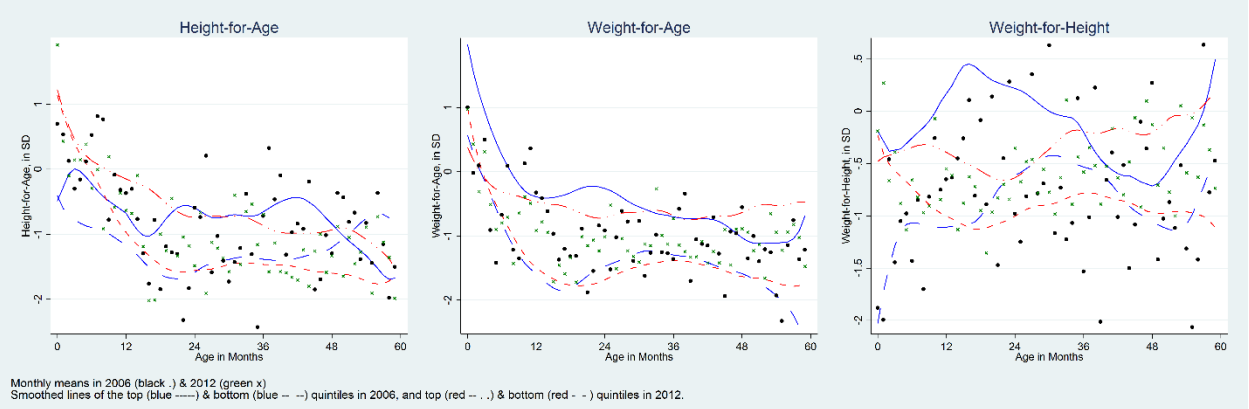
(i) Algeria 2002-2006



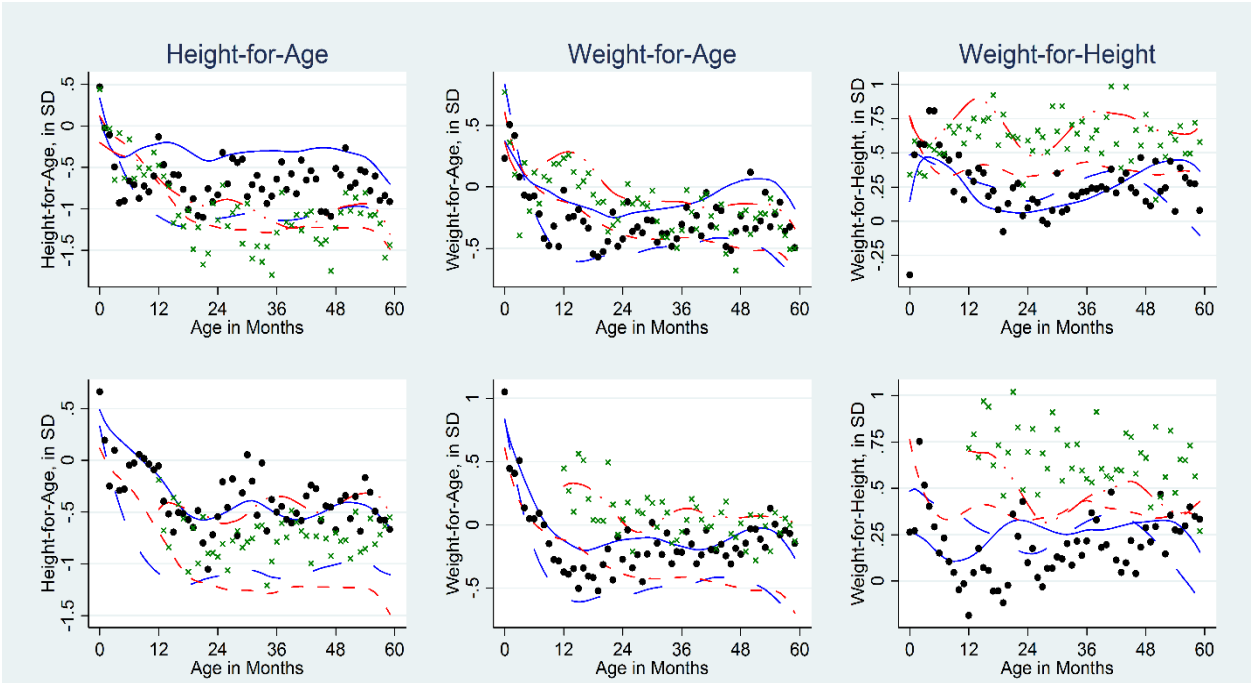
(ii) Comoros 2012



(iii) Djibouti 2006-2012

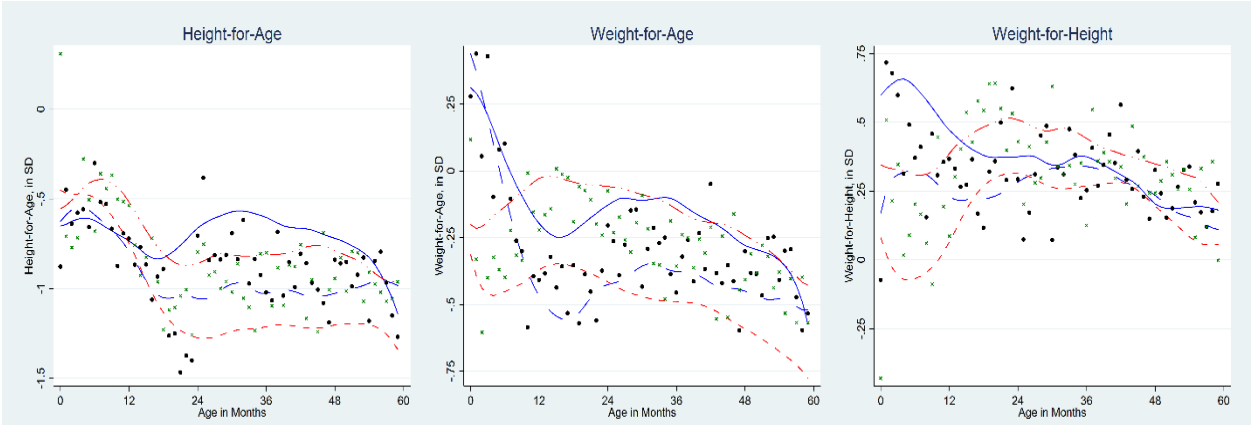


(iv) Egypt 2005-2008-2014-2015



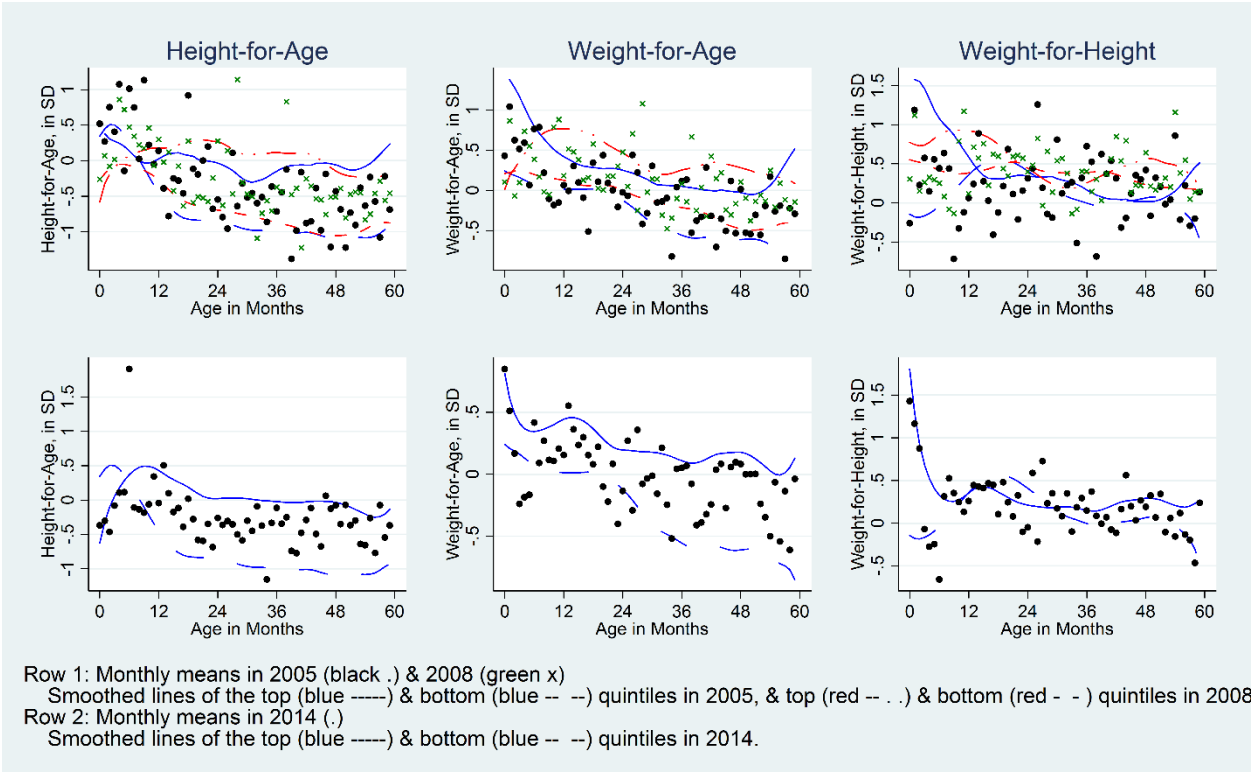
Row 1: Monthly means in 2005 (black .) & 2008 (green x)
Smoothed lines of the top (blue -----) & bottom (blue -- --) quintiles in 2005, & top (red -- . .) & bottom (red - -) quintiles in 2008
Row 2: Monthly means in 2014 (black .) & 2015 (green x)
Smoothed lines of the top (blue -----) & bottom (blue -- --) quintiles in 2014, & top (red -- . .) & bottom (red - -) quintiles in 2015

(v) Iraq 2006-2011



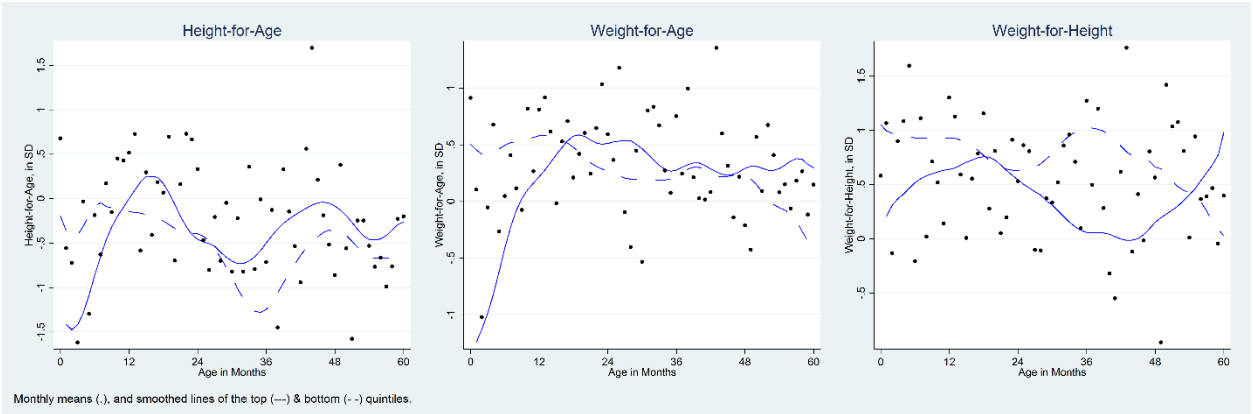
Monthly means in 2006 (black .) & 2011 (green x)
Smoothed lines of the top (blue -----) & bottom (blue -- --) quintiles in 2006, and top (red -- . .) & bottom (red - -) quintiles in 2011.

(vi) Jordan 2005-2008-2014



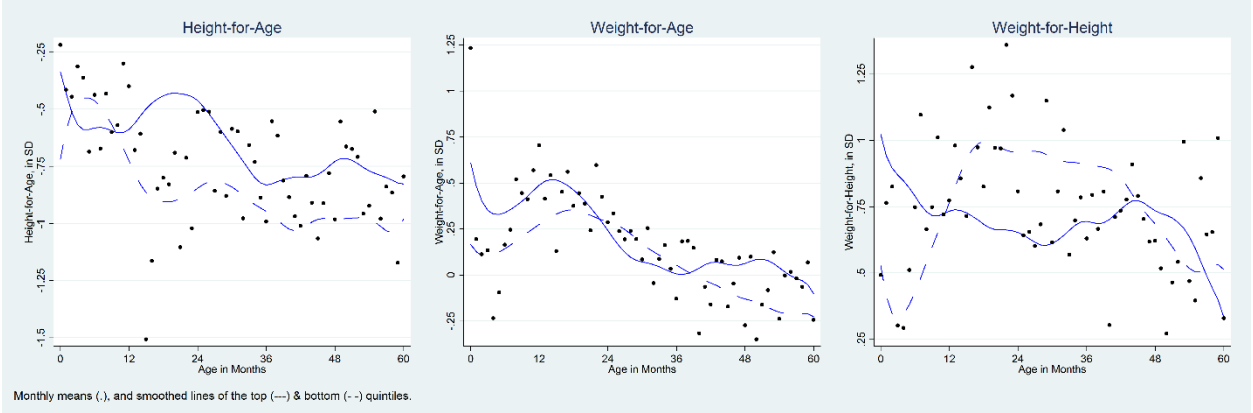
Row 1: Monthly means in 2005 (black .) & 2008 (green x)
Smoothed lines of the top (blue -----) & bottom (blue -- --) quintiles in 2005, & top (red -- . .) & bottom (red - -) quintiles in 2008
Row 2: Monthly means in 2014 (.)
Smoothed lines of the top (blue -----) & bottom (blue -- --) quintiles in 2014.

(vii) Lebanon 2004



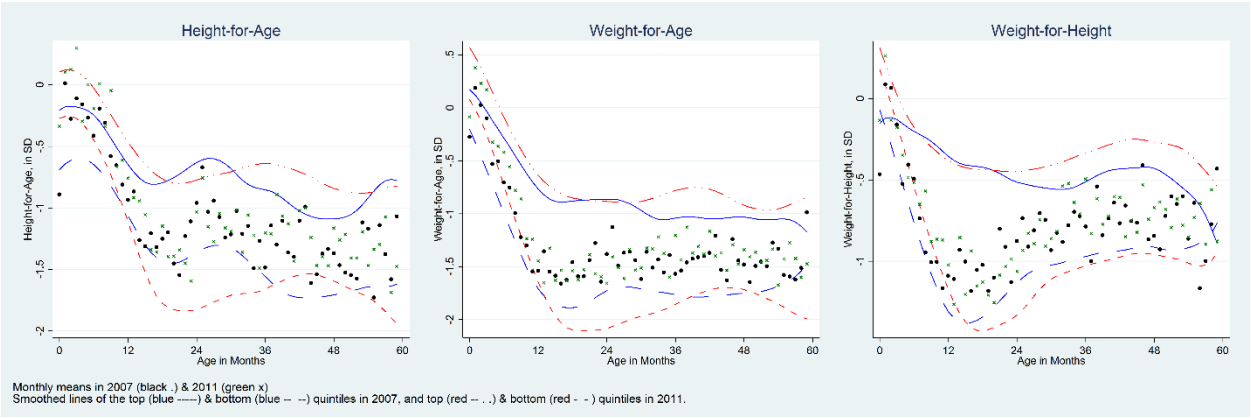
Monthly means (.), and smoothed lines of the top (---) & bottom (- -) quintiles.

(viii) Libya 2007

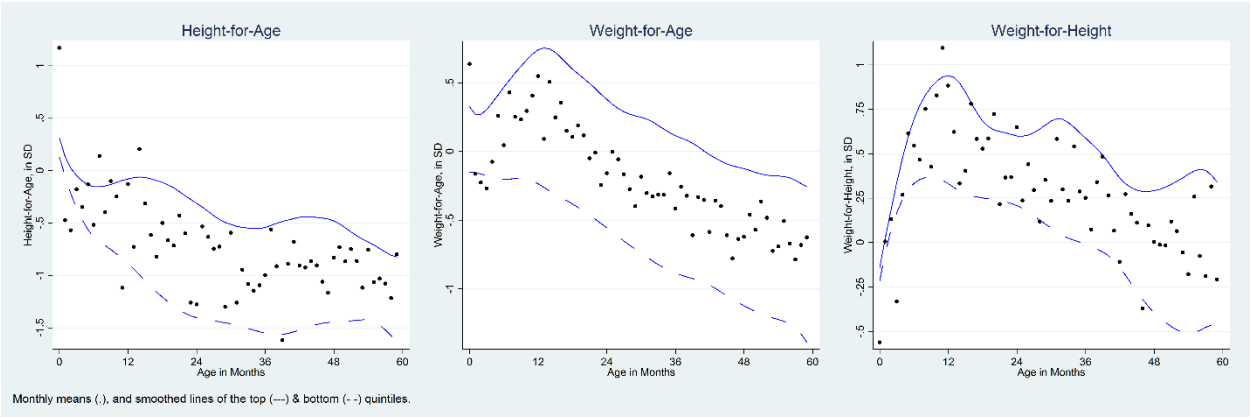


Monthly means (.), and smoothed lines of the top (---) & bottom (- -) quintiles.

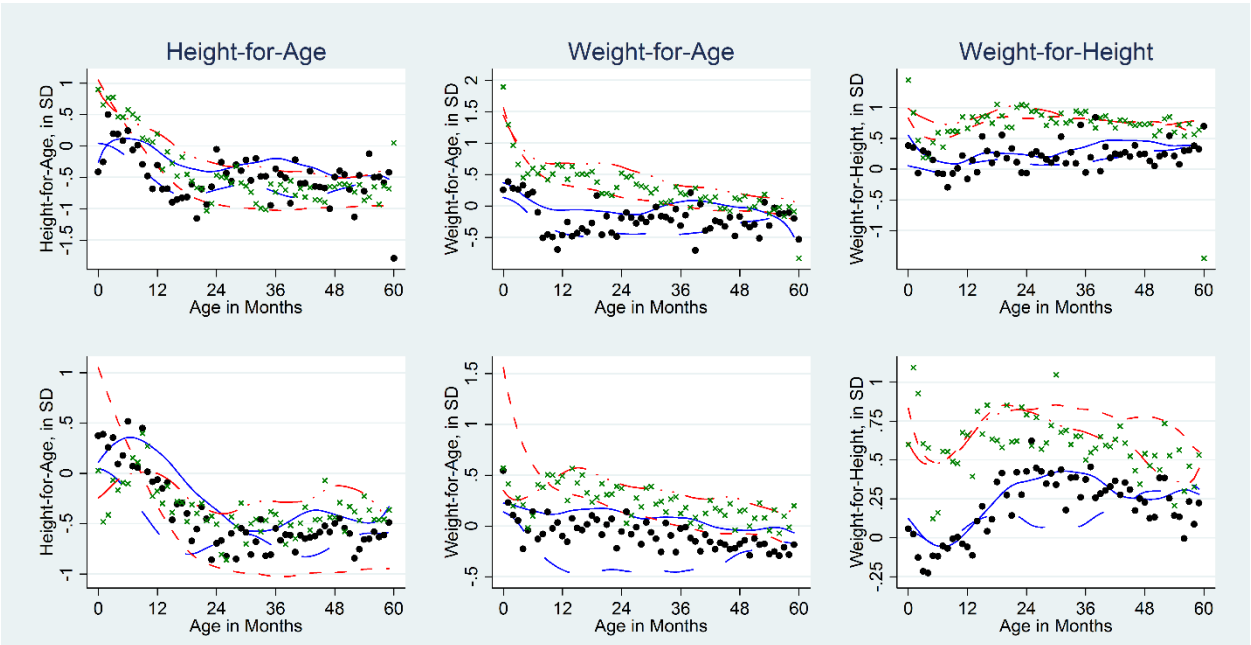
(ix) Mauritania 2007-2011



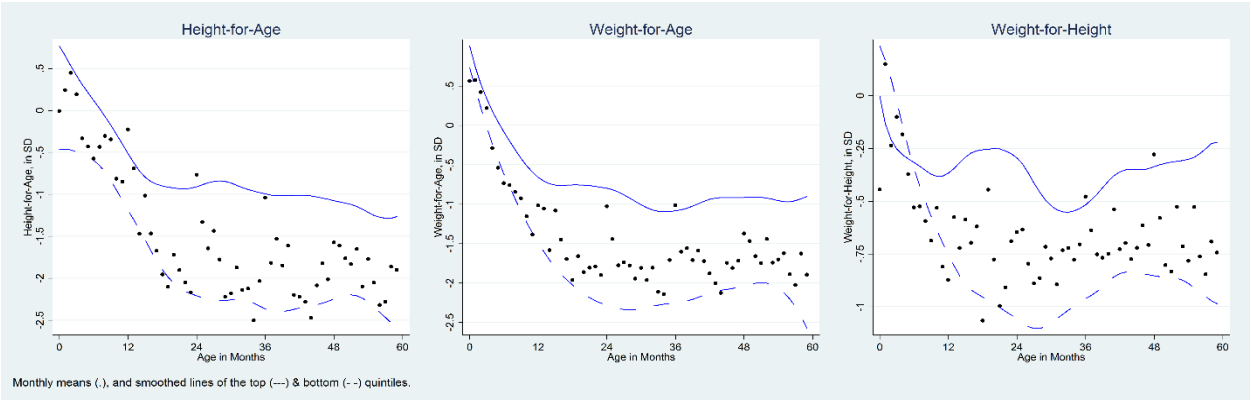
(x) Morocco 2004



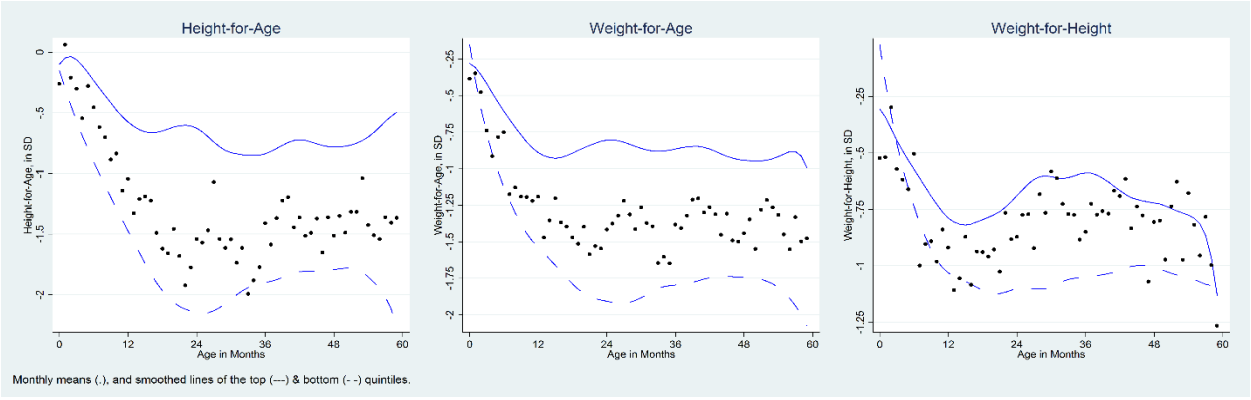
(xi) Palestine 2004-2006-2010-2014



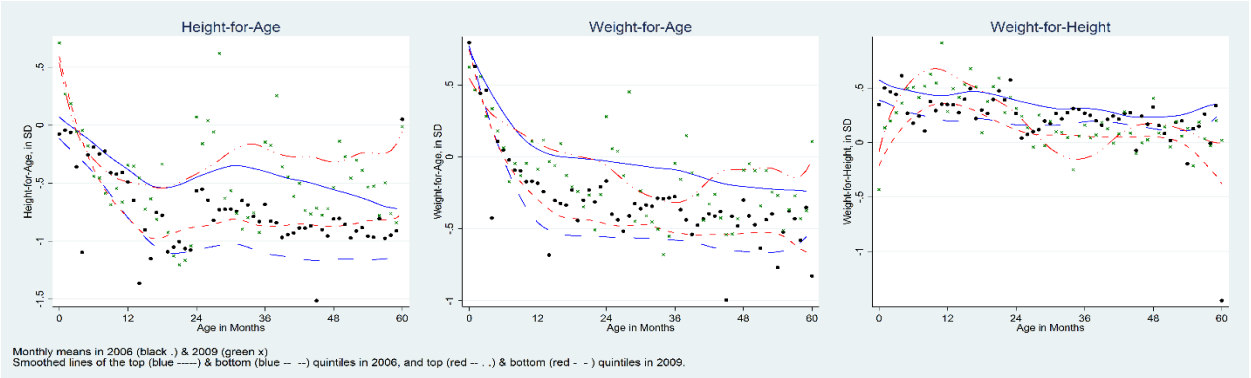
(xii) Somalia 2006



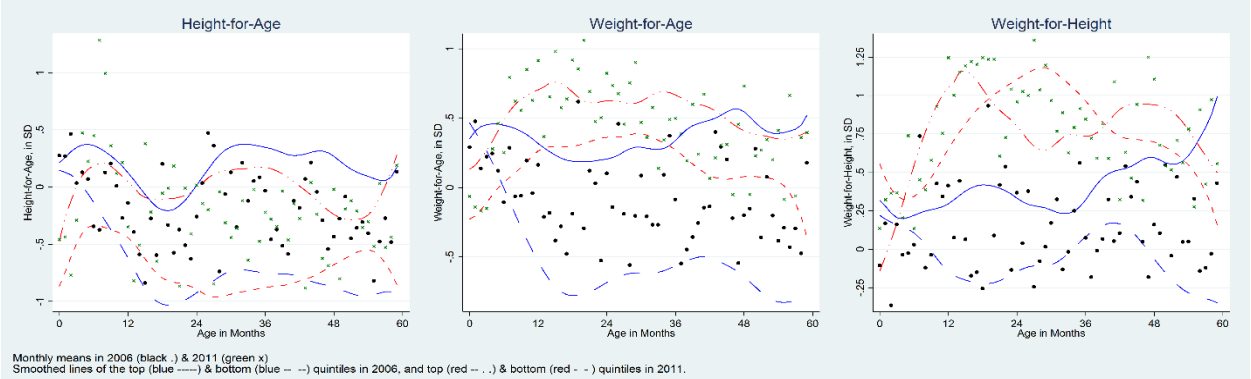
(xiii) Sudan 2010



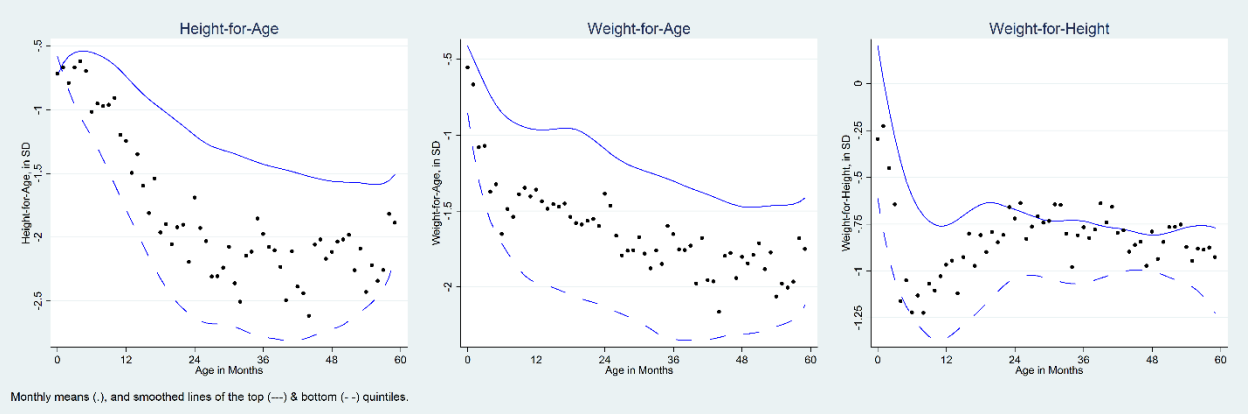
(xiv) Syrian Arab Republic 2006-2009



(xv) Tunisia 2006-2011



(xvi) Yemen 2013



Each point represents the mean of all observations for a particular month. Fitted lines for the top and bottom wealth-quintiles are lowess-smoothed using a locally-weighted running-line least-squares method.

IV. CONCLUSIONS

Results presented in table 1-3 and the figure have various implications for our understanding of children's access to ECD opportunities in the Arab region, as well as inequality in this access across countries and socioeconomic groups and over time. Access to ECD opportunities is for the most part shown to be inadequate, and subject to vast inequality across the Arab region as well as within individual countries. This is true of all forms of ECD, namely health care, nutrition and cognitive development, with particular deficiencies in children's height, access to iodized salt, enrolment in nurseries and preschool programmes, cognitive stimulation at home, and violent disciplining.

Opportunities are improving and becoming more equal over time across most countries and across most individual forms of ECD, but progress is uneven. For the rates of skilled care during child delivery, child immunization, and enrolment in preschool programmes, access has deteriorated in a large number of countries. Among the available survey years, conditions were improving across most of the evaluated ECD indicators in Algeria, Egypt, Iraq, Tunisia and Yemen, while a number of indicators were deteriorating in Djibouti, Mauritania and the Syrian Arab Republic. For other countries, progress was mixed.

Intergroup dissimilarity of within-country access to ECD – the portion of opportunities to be redistributed across socioeconomic groups to achieve equality within countries – has been falling across ECD indicators and countries, but these improvements have been uneven. Inequality in prenatal medical care, assistance with child delivery, immunization, salt iodization and access to nurseries and preschools has been falling. However, inequality in child mortality, rate of underweight, enrolment in preschool programmes, engagement in developmental activities at home, violent disciplining of children and exploitation of children for housework have deteriorated. Egypt, Jordan, the Sudan and Tunisia have seen systematic improvements in inequality across most ECD indicators, while Algeria, Djibouti and the Syrian Arab Republic have seen deteriorations in inequality across many dimensions of ECD.

Disparities between the poorest and the richest households appear to be largest for ECD activities facilitated by markets or local governments such as nursery and preschool attendance (ECCE and ECE), while they are relatively low for non-market activities such as child disciplining and the recruitment of children for household or non-household chores. This suggests that household and community resources and factors associated with them significantly affect children's access to formal opportunities for healthy growth. These effects can be remedied with appropriate interventions or assistance by governments or non-governmental organizations (NGOs). Over time, a bulk of worsening occurs among indicators of children's access to medication and nutrients necessary for cognitive development (immunization and salt iodization) and preschool education. These trends could be stopped and reversed by targeted governmental or NGO programmes. On the other hand,

children's development at home, including engagement in learning activities, duties with household chores and violent disciplining, are much more difficult to monitor and amend by policymakers and are much more resilient, as they arise from cultural norms and community traditions. Public education and involvement of local physicians, midwives and influential figures such as community elders may yield some progress.

One surprising finding relates to the change in economic conditions in countries experiencing civil conflict or popular uprisings versus those that avoided disruption. We find that in Egypt (2008-2014), ECD opportunities and inequality in them generally improved. Similarly, Jordan (2009-2012) and Yemen (2006-2013) have seen improving opportunities for child development. For Iraq (2006-2011), Libya (2007) and Tunisia (2006-2011), we only observed ECD opportunities at the outset of the Arab uprisings, with conditions above those typical in the region. On the other hand, in countries experiencing only minor or no unrest, children's opportunities did not improve. In Djibouti (2006-2012) and Mauritania (2007-2011) – in the period around the onset of the Arab uprisings – a number of ECD indicators stagnated or deteriorated. In the Comoros, a snapshot of 2012 shows that children there fared worse than in other Arab countries over the same period. Child mortality and stunting rates, underweight and wasting in the Comoros are high. It is unclear to what extent democratic movements and mobilized government in Arab Spring countries played a role in these positive developments, or whether the progress occurred before, during or after the period of civil unrest. Clearly, we would expect to see some negative effects of the climate of violence and anxiety during the uprisings, but our data do not reveal them.

Effects of long-running domestic political crises can be seen in two other countries, Somalia and Palestine. In Somalia (2006-2011), mired in civil war since the early 1990s, children's opportunities are the lowest in the region and retreating still. In Palestine (2004, 2006, 2010 and 2014), the fluctuating levels of ECD opportunities can at least partly be attributed to the changing face of Israeli occupation and military offenses in the Palestinian territories, particularly to the economic and civil restrictions imposed in 2006-2007.

Regarding within-country inequality in ECD opportunities, this study finds that household wealth and administrative region of residence are the most significant vectors of inequality in most ECD indicators, followed by mother's education. Wealth and region of residence have strong bearings on mothers' access to prenatal check-ups, children's physical growth, access to nutrients such as iodine, early childhood education and cognitive development at home. Region of residence also explains a bulk of inequality in immunization rates, violent disciplining and child labour. Mother's education explains a quarter to a third of all inequality in prenatal check-ups and child mortality. These findings can be seen as attesting to the importance of the availability of family resources, public infrastructure and community resources, social capital and access to information. The particularly dire situation regarding access to early-childhood education in the Arab region reflects the generally low level of public spending on pre-primary education, which increases the burden on families with young children, and disproportionally affects children from poor socioeconomic backgrounds.

We concur with existing studies that children's opportunities in the Arab region in the past decade have improved in part due to growth in incomes, parents' education, public spending on health, urbanization and food security (Iqbal and Kiendrebeogo, 2014). These factors appear to be crucial to further improving and equalizing opportunities for early childhood development. Other than these factors, latent regional differences are also an important driver of opportunities, as seen in many existing studies from the Arab region (Boutayeb and Helmert, 2011; Salehi-Isfahani and others, 2012; Ramadan and others, 2015). Decomposition of these regional differences into causal effects of various regional characteristics – such as quality of governance, cultural institutions, physical infrastructure, proximity to markets and natural resources – would be a fruitful subject for future research.

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Annex I

Description of data

Table A1 reports on the geographic and historical coverage of our study, and of El-Kogali and Krafft (2015). For most countries, we have newer and older data than El-Kogali and Krafft and for some countries, we have versions of the surveys from other sources. These surveys allow us to report additional ECD indicators unavailable in their book, and discuss changes in ECD opportunities over time. Naturally there is a nontrivial overlap of results between our study and those of El-Kogali and Krafft's, and Hlasny and Intini's. Given the focus of our study, we opt to report results from all survey waves, irrespective of their appearance in previous studies.

Table A1. Surveys studied here vs. those in El-Kogali and Krafft (2015) and Hlasny and Vintini (2015)

Country	El-Kogali & Krafft (2015)	Hlasny & Vintini (2015)	Additional in this study
Greater Maghreb region			
Algeria	PAPFAM 2002[a]	MICS 2006	
Libya	PAPFAM 2007[a]		
Mauritania		MICS 2007	MICS 2011
Morocco	DHS 2003/2004[a], MICS/PAPFAM 2006[a]	PAPFAM 2011	
Tunisia	MICS 2011[a]	MICS 2006	
Mashriq region			
Iraq	MICS 2006[a] & 2011[a]		
Jordan	DHS 2012[a]	DHS 2007 & 2009	
Lebanon	PAPFAM 2004[a]	MICS 2006	
Palestine	PAPFAM 2006[a]	DHS 2004, MICS 2010 & 2014	
Syrian Arab Republic	MICS 2006[a], PAPFAM 2009[a]		
Red Sea region			
Djibouti	MICS 2006[a], PAPFAM 2012[a]		
Egypt	DHS 2008[a]	DHS 2005 & 2014	DHS 2015 (Special)
Somalia		MICS/PAPFAM 2006	MICS 2011
Sudan		PAPFAM 2006	MICS 2010
Yemen	PAPFAM 2003, MICS 2006[a]	DHS 2013	
Southeast Africa			
Comoros		DHS 2012	

[a] We have access to these surveys previously evaluated by El-Kogali and Krafft (2015). El-Kogali and Krafft evaluated these survey waves, but often reported a smaller number of results for them.

DHS is the Demographic and Health Survey; MICS is the Multiple Indicator Cluster Survey; and PAPFAM is the Pan-Arab Project for Family Health Survey.

Note on data comparability across countries

Results in the main text are comparable across socioeconomic groups in a country and are representative of the underlying population. This is achieved by a nationally-representative stratified sampling design, the usage of sampling weights and partial harmonization across DHS, MICS and PAPFAM surveys. However, not all numerical results are exactly comparable across countries, because of various data issues, including different sample sizes, different availability and different statistical definitions of some variables, and different norms and institutions for pre-primary education, vaccination, health-centre visits. While these issues are present even across multiple waves of a single national survey, they are less pronounced, since the various waves are typically administered by some of the same people, making the same country-specific considerations.

Table A2. Sample sizes available in various survey modules

	Households (complete interviews)	Ever-married women 15-49 in women's module (complete int.)	Children younger than 5 covered by responding women (complete int.)	Live births covered by responding women
Algeria 2002	5,532	9,597	4,348	11,950
Algeria 2006	29,008	43,641	14,593	--
Comoros 2012	4,482	3,094	3,022	2,016
Djibouti 2006	4,888	6,019	2,245	--
Djibouti 2012	5,563	3,304	3,205	3,394
Egypt 2005	15,842	13,851	13,621	13,851
Egypt 2008	14,733	12,008	10,540	8,367
Egypt 2014	28,175	59,266	56,568	15,848
Egypt 2015	7,516	--	3,574	--
Iraq 2006	16,699	27,186	16,469	17,363
Iraq 2011	35,701	55,194	33,908	13,994
Jordan 2007	14,564	11,622	10,876	10,426
Jordan 2009	13,577	10,109	9,407	7,759
Jordan 2012	15,190	10,304	6,350	8,462
Lebanon 2004	5,532	3,499	1,804	--
Lebanon 2006	5,532	3,032	1,174	--
Libya 2007	11,709	11,920	12,550	--
Mauritania 2007	10,361	12,549	8,672	--
Mauritania 2011	10,116	12,754	9,278	--
Morocco 2004	11,513	16,798	6,180	4,977
Morocco 2006	7,931	6,608	3,721	--
Morocco 2011	15,343	11,069	6,117	--
Palestine 2004	5,799	4,972	4,833	4,974
Palestine 2006	11,509	9,785	10,107	--
Palestine 2010	13,330	11,384	10,070	11,298
Palestine 2014	10,182	13,367	7,816	7,948
Somalia 2006	5,969	8,438	8,812	6,348
Somalia 2011	7,124	11,357	9,089	31,965
Sudan 2006	1,000	6,563	8,175	--
Sudan 2010	14,778	17,174	13,282	47,030
Syrian Arab Republic 2006	19,019	25,026	11,017	--
Syrian Arab Republic 2009	24,883	17,565	16,631	13,281
Tunisia 2006	8,681	6,152	3,050	--
Tunisia 2011	9,171	10,215	2,899	2,977
Yemen 2003	12,885	11,292	10,116	--
Yemen 2006	3,586	3,742	3,783	4,099
Yemen 2013	17,351	16,093	15,367	16,072

Notes: Sample sizes are only partially standardized due to differences in format, variable coverage and missing observations in individual surveys. Samples sizes used in regression models may be lower than these numbers due to missing data for dependent or explanatory variables, or perfect predictions of outcomes among some explanatory variables for some observations. "--" indicates missing data for a particular survey module.

Annex II

Additional results

Across the vast majority of results in table A3 – for most countries and most ECD indicators – ECD opportunities improve significantly with household wealth. This validates the choice of household wealth as an aggregate indicator of families' socioeconomic background, and confirms that inequality is systematically related to family resources.

Table A4 accounts for several other drivers of children's access to ECD opportunities, in view of the presence of other circumstances across households that affect ECD opportunities and that are themselves correlated with wealth. Table A4 presents the predicted values of children's propensities to have access to each ECD opportunity from probability models where the values of socioeconomic explanatory variables are fixed at the least-advantaged or the most-advantaged levels, while the values of other explanatory values are fixed at zero. The least advantaged households are those in the bottom wealth quintile, in rural areas of least-advantaged administrative regions, and where the mother and her partner (or child's father, or household head) have received no education. Female children and households with female heads are also taken to be less advantaged in selected models. Differences between the least-advantaged and the most-advantaged groups' outcomes are interpreted as the cumulative disparities in ECD opportunities between households facing the least-advantaged set of circumstances versus those facing the most-advantaged set.

These differences are for the most part expected, implying that children in the poorest, least educated, rural households in impoverished regions face particular constraints on their access to developmental opportunities. This serves to validate our choice of indicators for households' socioeconomic circumstances. The differences in ECD prevalence rates in table A4 are larger than those in table A3, suggesting that household's contemporaneous durable holdings are just one contributing factor to the overall inequality in children's access to ECD. Households' residence, composition and education – and thus wealth in previous years – also contribute. Comparing the ranges in tables A3 and A4 suggests that household wealth may account for about two-thirds of the disparity in ECD opportunities among children. Across all countries and ECD opportunities, the ranges of values in table A3 are typically two-thirds as wide as those in table A4.

Table A5 evaluates the disparity in opportunities for ECD that should be bridged to achieve equal opportunities across socioeconomic groups in each country. The table quantifies the within-country dissimilarity in prevalence rates of various ECD activities across households in different socioeconomic circumstances. For most ECD indicators, between 10 and 30 per cent (average 20 per cent) of relevant ECD opportunities should be redistributed across socioeconomic classes from more-advantaged to less-advantaged groups, if inter-group equality of opportunities is desired. These numbers are quite large and many are statistically significant (available on request), suggesting that current distribution within Arab countries is quite unequal.

Table A3. ECD access among poorest vs. wealthiest quintile households (children or women with access to ECD, poorest–richest %)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. Activities	ECCE3-4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Algeria 2002	63.4-92.6	39.2-67.0	87.1-98.2	83.2-96.1	0.9-0.4	1.4-0.1	28.8-18.2	14.3-8.0	12.7-8.5	.	.	.	.	.	.
Algeria 2006	76.0-97.9	36.7-77.0	87.7-98.5	81.8-95.7	.	.	17.0-8.9	5.6-2.7	3.8-4.9	40.2-79.9	48.5-74.7	3.2-20.8	6.2-48.1	82.6-88.2	19.0-25.8
Comoros 2012	87.5-95.1	43.4-69.5	67.8-95.2	42.8-72.2	1.4-3.2	2.6-5.2	37.5-22.1	20.0-10.2	13.3-10.4	97.0-86.9	.	.	.	.	28.3-11.1
Djibouti 2006	86.3-94.2	.	83.6-93.3	44.5-53.6	.	.	43.2-25.4	38.8-22.8	33.1-24.7	0.0-0.0	22.4-40.1	5.8-23.3	1.7-16.1	71.8-58.0	22.6-7.4
Djibouti 2012	68.4-97.6	20.9-41.4	58.2-99.6	17.8-23.7	3.5-2.9	5.1-5.4	41.1-22.5	39.7-13.4	29.0-13.4	.	25.1-53.0	.	.	24.5-47.2	.
Egypt 2005	46.8-92.3	31.3-87.9	50.8-96.9	77.4-83.4	2.3-1.5	4.2-1.7	23.6-14.4	7.7-6.3	3.6-6.2	52.2-96.3	.	10.8-54.3	2.8-28.3	97.0-93.8	20.3-20.5
Egypt 2008	53.5-92.5	41.7-90.3	55.3-97.0	89.3-94.1	1.7-1.2	2.9-1.5	29.5-27.0	7.5-5.4	7.2-7.7	55.5-91.5	.	11.2-55.6	.	.	.
Egypt 2014	83.5-96.2	71.6-93.6	82.4-99.0	26.9-34.2	2.0-1.0	3.2-1.5	19.7-19.3	7.0-5.9	6.5-6.5	76.8-97.7	.	41.9-62.7	.	94.8-92.2	60.6-30.3
Egypt 2015	.	.	.	.	.	.	16.9-9.4	3.1-1.7	0.9-4.4	.	.	34.9-54.2	.	.	.
Iraq 2006	64.9-90.9	46.0-87.1	48.7-70.8	36.4-62.8	2.4-1.9	3.7-2.8	24.9-19.8	8.8-8.2	5.2-5.9	18.7-34.8	30.2-57.6	0.3-7.8	0.6-10.1	89.2-100.0	14.6-14.9
Iraq 2011	61.0-91.3	35.9-66.4	82.1-95.9	48.5-76.0	1.9-2.3	3.3-3.4	24.0-20.6	7.7-6.4	6.5-6.6	13.0-41.4	36.3-73.6	1.1-9.9	2.3-17.3	77.4-68.3	8.9-9.3
Jordan 2007	96.8-99.9	90.1-98.4	98.0-100.0	82.2-89.4	1.7-2.3	2.4-2.8	18.0-9.0	8.1-4.1	7.2-8.1	.	.	.	.	.	.
Jordan 2009	.	.	.	.	2.0-0.3	3.1-1.2	12.7-1.3	2.4-0.1	1.6-0.2	.	.	.	.	.	.
Jordan 2012	97.4-100.0	88.3-98.7	98.9-100.0	89.3-91.1	2.2-1.2	2.9-1.2	13.9-1.8	5.3-0.4	3.0-2.6	.	74.6-86.5	10.5-39.1	.	95.7-76.2	.
Lebanon 2004	89.2-100.0	.	98.4-98.7	33.8-78.1	.	.	25.4-14.6	3.2-7.1	5.6-9.7	94.1-85.3	.	88.4-96.1	.	.	.
Lebanon 2006	98.8-85.6	89.8-66.7	98.5-84.4	65.1-29.6	.	.	.	.	.	77.9-89.8	.	98.4-89.3	.	.	.
Libya 2007	89.7-96.5	66.9-78.0	98.2-98.8	81.6-86.3	1.1-0.8	1.9-1.2	21.9-19.2	6.2-4.5	7.9-6.4	44.1-61.1	.	2.7-7.9	.	.	7.9-8.5
Mauritania 2007	52.2-93.9	.	19.6-96.5	26.9-38.5	.	.	33.0-17.3	39.9-14.1	16.3-6.6	1.5-3.2	27.6-46.5	2.5-18.7	.	.	.
Mauritania 2011	28.7-37.8	10.8-25.7	3.1-37.3	28.4-36.9	.	.	33.7-14.1	40.8-12.0	18.4-6.0	4.3-13.5	.	.	.	.	.
Morocco 2004	39.8-93.1	10.6-60.7	29.6-95.7	81.5-98.1	3.6-1.8	5.5-2.2	34.9-14.9	16.6-4.2	15.4-8.6	.	.	.	.	.	.
Morocco 2006	.	.	.	.	.	.	.	.	.	6.8-34.0	38.6-83.6	6.3-82.8	7.7-75.3	97.4-93.0	12.1-20.4
Morocco 2011	50.3-98.8	12.2-75.7	13.3-37.3	44.0-54.9	.	.	.	.	.	.	15.8-59.4	.	.	.	.

Table A3 (*continued*)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. Activities	ECCE3-4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Palestine 2004	97.9-98.8	86.6-87.4	91.6-90.9	95.9-92.4	2.7-1.5	4.9-2.8	13.0-9.9	7.5-4.7	3.9-3.5	63.5-65.7	.	.	60.2-79.4	.	.
Palestine 2006	97.2-99.1	83.5-94.4	97.3-97.3	89.7-83.7	.	.	15.8-10.0	2.2-2.4	2.2-2.4	87.6-88.6	61.9-80.0	24.0-48.1	.	96.5-93.4	11.8-18.3
Palestine 2010	97.9-98.5	90.8-95.7	70.1-61.3	93.2-86.9	1.6-1.0	2.7-1.2	14.5-8.4	4.6-2.9	3.3-3.4	80.5-76.2	57.3-78.3	11.0-29.0	92.2-92.0	90.6-91.9	26.6-41.2
Palestine 2014	99.5-98.8	95.9-97.3	99.6-99.3	93.6-73.1	0.9-0.6	1.8-1.2	7.6-7.0	1.6-1.6	0.9-1.8	78.5-71.6	70.1-88.5	21.2-39.9	92.4-93.5	96.5-90.8	.
Somalia 2006	.	.	.	4.2-20.1	2.9-3.4	7.7-8.5	48.0-21.6	48.9-16.1	15.4-4.9	1.8-2.2	63.0-69.9	0.5-6.0	0.0-18.5	.	59.6-52.9
Somalia 2011	12.9-61.7	14.5-31.0	9.6-72.7	3.0-12.4	3.3-2.7	6.4-3.8	.	.	.	.	58.2-73.0	0.5-6.1	5.6-24.1	73.6-72.1	32.1-23.5
Sudan 2006	29.7-95.3	14.3-72.7	38.3-94.3	3.8-5.8	.	.	.	.	.	25.6-3.5	.	.	.	.	.
Sudan 2010	31.0-88.5	32.6-77.0	2.7-50.3	28.2-63.1	3.2-1.9	4.9-3.4	41.6-13.9	37.8-13.4	17.5-12.0	20.3-5.7	.	9.5-47.9	9.7-69.3	.	.
Syrian Arab Republic 2006	66.8-93.9	.	74.9-98.6	27.6-36.5	.	.	32.2-23.1	14.6-9.3	12.7-10.7	.	42.5-70.6	1.9-14.5	23.3-58.9	79.1-84.7	11.0-13.2
Syrian Arab Republic 2009	77.3-96.6	56.1-84.3	89.9-99.4	46.3-61.2	1.3-1.5	2.0-1.9	30.8-20.8	14.3-9.5	12.7-11.4	13.1-56.5	28.7-67.2	3.7-29.7	27.5-40.9	60.8-56.5	3.9-2.9
Tunisia 2006	26.4-81.7	40.7-78.0	.	79.6-83.9	.	.	13.1-3.6	5.9-1.5	2.4-2.2	.	23.8-72.5	4.8-53.2	.	98.6-99.2	.
Tunisia 2011	95.6-100.0	73.4-96.5	93.8-99.6	89.2-93.2	2.2-0.9	3.0-1.5	15.6-7.7	3.2-2.2	2.0-3.6	.	44.2-91.0	13.1-82.0	67.4-97.9	95.2-96.8	16.1-21.2
Yemen 2003	26.0-72.4	15.7-54.1	20.9-45.2	14.7-74.4	2.6-2.6	5.5-4.2	57.1-38.2	54.9-31.3	18.3-9.7	.	.	.	.	.	.
Yemen 2006	32.0-79.3	.	17.1-73.6	19.8-75.1	4.9-3.0	10.0-4.3	.	.	.	.	13.5-44.6	0.0-9.1	.	84.5-99.2	17.6-15.0
Yemen 2013	40.0-87.6	8.2-55.7	18.2-79.3	24.7-62.6	2.0-2.4	3.2-3.3	59.0-25.7	54.0-21.6	20.9-12.3	27.3-71.6	.	.	.	76.3-74.5	.
Wghtd. avg. bottom-top[a]	65.2-92.8	45.5-78.0	60.1-83.3	43.7-59.1	2.2-1.5	3.4-2.1	27.8-14.1	16.3-6.7	8.6-7.1	38.4-60.4	35.0-67.9	14.7-40.9	10.4-45.3	86.2-83.5	29.5-21.4

Notes: This table is comparable to table 2A.1 (El-Kogali & Krafft, 2015, p. 44). Reported numbers are the differences in average access rates between the bottom and the top wealth quintile. "." Unavailable due to missing data. "—" non-representative due to estimation issues such as small sample sizes.

Access to prenatal and delivery care is evaluated among women who gave birth in the past two years; the remaining indicators are evaluated among children.

[a] Average of countries' most recent waves for which the indicator is available, weighted by estimated 2015 population size (UNDESA, 2015).

Table A4. Access to ECD across least vs. most advantaged households (children or women with access to ECD, least–most %)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. Activities	ECCE3-4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Algeria 2002	52.1-99.5	32.3-79.5	77.4-96.9	83.1-95.9	0.8-0.5	1.5-0.3	27.9-19.3	14.2-7.9	11.7-7.1	.	.	.	.	.	.
Algeria 2006	60.0-99.5	17.6-91.9	60.6-98.8	75.4-96.7	.	.	26.9-6.8	13.5-1.3	5.8-4.4	14.0-93.4	34.0-82.7	3.3-36.9	4.4-60.6	86.2-82.1	15.9-25.4
Comoros 2012	76.7-97.4	43.4-88.0	57.2-99.9	66.6-94.0	2.3-5.7	4.1-5.6	21.3-10.3	17.2-4.3	13.2-10.6	98.9-86.8	.	.	.	.	32.2-7.7
Djibouti 2006	40.8-99.1	.	37.0-96.9	30.7-52.7	.	.	41.8-33.7	44.1-25.3	47.0-26.2	.	11.8-42.5	5.6-28.4	0.2-27.6	59.6-58.3	26.6-10.7
Djibouti 2012	60.9-99.1	8.1-45.2	41.7-100.0	17.4-20.4	4.0-2.0	7.0-5.0	17.1-97.0	15.7-58.2	43.0-7.7	.	23.2-53.5	.	.	0.0-100.0	
Egypt 2005	34.0-94.9	21.8-92.0	40.1-97.8	77.2-79.5	1.9-1.5	4.8-1.2	24.0-15.5	8.0-9.0	3.5-8.4	47.7-98.7	.	4.3-62.0	1.6-40.2	97.8-89.5	16.8-19.2
Egypt 2008	37.9-96.9	27.5-95.9	45.6-98.7	87.6-92.6	1.9-2.2	2.8-2.5	25.5-23.7	6.7-7.3	7.2-11.6	43.7-91.8	.	5.1-67.7	.	.	.
Egypt 2014	68.5-98.9	53.5-97.1	66.4-99.4	25.0-42.9	2.2-0.9	4.1-1.1	21.9-17.1	9.3-4.6	7.3-6.9	75.5-98.9	.	22.0-63.8	.	95.5-94.2	56.2-22.6
Egypt 2015	.	.	.	.	.	.	24.5-9.2	3.1-1.3	0.5-9.3	.	.	19.5-65.7	.	.	.
Iraq 2006	50.2-88.2	25.5-84.6	37.3-93.5	14.8-89.1	3.1-2.2	5.0-2.6	30.6-8.4	9.7-6.6	5.2-4.5	9.0-77.1	22.5-64.8	0.1-21.3	0.1-31.2	92.4-56.6	18.4-15.2
Iraq 2011	43.9-96.4	23.9-79.4	70.4-98.2	34.3-90.7	2.3-2.5	3.7-3.1	30.5-12.1	11.2-3.7	7.9-4.2	8.5-66.1	19.1-84.9	0.1-22.1	0.1-58.7	80.6-62.6	6.6-2.9
Jordan 2007	73.5-100.0	57.9-98.7	96.2-99.9	52.4-90.0	0.0-0.7	0.2-1.2	32.0-9.0	19.2-4.6	16.3-8.2	.	.	.	.	.	.
Jordan 2009	.	.	.	.	1.3-0.2	1.7-1.2	24.9-1.0	5.4-0.0	3.0-0.2	.	.	.	.	.	.
Jordan 2012	97.6-100.0	75.9-98.8	94.7-100.0	33.5-89.2	0.7-0.5	0.8-0.5	29.4-1.7	6.7-0.2	5.7-1.8	.	42.3-86.9	4.7-44.3	.	97.3-63.4	.
Lebanon 2004	60.0-100.0	.	.	12.0-79.0	.	.	48.6-5.7	3.7-4.3	3.8-1.6	94.5-70.2	.	68.1-100.0	.	.	.
Lebanon 2006	96.0-99.0	49.6-92.6	94.0-98.5	17.7-43.7	.	.	.	.	.	84.5-75.3	.	99.4-87.4	.	.	.
Libya 2007	79.5-98.1	51.9-87.5	91.9-96.0	71.7-88.8	0.0-1.1	0.0-1.7	18.2-20.7	5.8-8.1	8.1-10.6	7.0-88.4	.	0.5-14.3	.	.	8.7-27.0
Mauritania 2007	57.2-93.7	.	16.3-96.9	24.0-14.8	.	.	32.8-11.8	40.0-13.3	16.3-10.6	1.0-3.0	25.0-58.6	1.6-67.6	.	.	.
Mauritania 2011	20.8-27.1	2.9-17.3	2.5-26.6	39.3-36.6	.	.	34.7-12.1	42.5-7.3	17.3-4.8	2.8-21.8	.	.	.	.	.
Morocco 2004	37.2-99.3	9.6-89.5	26.9-99.8	88.9-97.2	2.3-1.4	3.5-1.1	35.1-11.0	22.6-2.4	22.4-4.7	.	.	.	.	.	.
Morocco 2006	.	.	.	.	.	.	.	.	.	20.2-54.7	41.3-84.1	3.0-90.5	2.6-93.3	95.9-94.1	14.5-27.3
Morocco 2011	66.11-100.0	11.8-94.4	25.2-32.8	52.6-56.2	.	.	.	.	.	.	13.0-76.5	.	.	.	.

Table A4 (*continued*)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. Activities	ECCE3-4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Palestine 2004	100.0-98.1	86.2-84.0	96.0-90.6	90.2-91.0	4.6-1.0	7.7-1.2	17.2-6.9	7.9-3.4	1.1-2.8	82.2-61.8	.	.	30.4-85.5	.	.
Palestine 2006	83.9-98.8	79.5-93.1	95.6-97.7	78.4-78.4	.	.	15.3-5.9	3.2-1.7	4.2-2.5	83.8-89.8	49.2-85.7	12.2-57.6	.	96.1-94.8	9.0-14.6
Palestine 2010	93.9-99.1	75.8-98.1	81.5-40.1	90.4-94.8	1.6-1.2	2.8-1.4	17.2-8.1	5.0-2.8	1.4-3.9	79.2-92.7	54.3-73.0	4.4-28.9	78.2-96.9	92.6-88.0	30.2-23.5
Palestine 2014	100.0-99.6	93.2-98.6	100.0-99.4	100.0-79.8	1.0-0.8	1.6-1.5	45.3-4.7	0.0-1.0	0.0-0.5	71.8-90.0	49.5-86.0	16.9-60.9	43.6-98.7	100.0-92.8	.
Somalia 2006	.	.	.	2.9-13.7	3.4-5.4	8.4-7.2	52.5-10.0	49.4-7.5	12.2-8.1	0.5-4.6	0.3-16.1	60.9-82.5	0.02-20.0	.	59.5-47.9
Somalia 2011	17.4-85.0	9.5-55.5	6.6-91.7	3.0-27.5	0.0-2.9	0.1-4.6	.	.	.	.	64.5-75.2	0.3-10.8	6.2-38.7	76.1-74.7	33.6-15.5
Sudan 2006	20.4-99.9	7.9-82.6	35.0-99.7	0.2-70.8	.	.	.	.	.	30.7-2.8	.	.	.	.	.
Sudan 2010	19.3-95.4	28.3-94.3	0.6-65.5	19.2-55.7	0.0-26.7	0.0-63.3	33.7-11.8	32.3-11.7	13.9-12.4	25.1-3.3	.	11.6-64.8	8.6-82.5	.	.
Syrian Arab Republic 2006	63.5-99.9	.	58.9-99.9	23.6-37.2	.	.	32.7-7.7	20.1-4.7	19.4-8.9	.	35.3-80.8	0.3-39.9	0.0-96.2	72.2-88.3	0.0-65.2
Syrian Arab Republic 2009	67.5-99.9	47.2-98.7	73.9-99.9	33.3-67.6	1.6-0.8	2.2-1.0	30.5-9.4	20.3-2.5	17.2-6.1	1.0-78.4	19.6-75.3	0.2-69.5	24.2-52.8	77.0-84.1	2.5-3.7
Tunisia 2006	29.9-94.5	44.7-86.3	.	77.7-85.8	.	.	5.4-2.9	1.5-4.2	1.2-4.1	.	25.8-81.7	1.6-80.8	.	100.0-93.3	.
Tunisia 2011	91.5-99.3	55.4-99.1	73.0-100.0	58.7-91.3	1.6-1.1	5.8-2.2	17.8-6.8	4.9-2.8	2.1-7.0	.	7.1-97.4	3.8-92.2	58.8-99.3	93.6-98.1	14.0-18.4
Yemen 2003	18.0-93.2	12.6-73.2	5.1-65.7	5.9-88.5	2.2-4.7	5.6-3.6	56.0-36.0	54.0-33.0	19.0-12.0	.	.	.	.	.	.
Yemen 2006	25.3-96.2	.	16.9-96.2	14.9-89.6	4.7-3.6	10.3-5.1	.	.	.	.	10.5-55.1	0.0-24.3	.	80.9-100.0	11.4-38.2
Yemen 2013	29.0-97.0	6.5-80.6	14.5-90.6	24.1-70.3	1.4-0.9	2.5-0.9	61.7-19.4	59.0-15.3	21.7-13.6	21.2-74.2	.	.	.	67.2-69.0	.
Wghtd. Avg. bottom-top[a]	55.5-97.0	33.4-90.3	49.2-86.4	36.3-63.7	1.5-4.4	2.7-9.1	32.6-10.5	18.4-4.8	9.3-7.6	35.0-69.1	23.5-77.6	9.8-55.7	7.4-61.5	87.4-83.9	27.5-20.7

Notes: "." Unavailable due to missing data, small sample sizes, missing covariates, or perfect collinearity or perfect prediction of outcomes among covariates.

Access to prenatal and delivery care is evaluated among women who gave birth in the past two years; the remaining indicators are evaluated among children.

Reported numbers are the differences in predicted access rates between the least-advantaged and the most-advantaged groups, estimated from probit models, with explanatory variables fixed at counterfactual 'least advantaged' and 'most advantaged' values. Least vs. most advantaged households are identified as those in the bottom vs. top quintile of income distribution, in rural vs. urban areas, in disadvantaged vs. most advantaged administrative region within the country, with mother and household head with no vs. higher education. In some specifications, households with female vs. male child (all indicators but prenatal and delivery care) and with female vs. male household head (iodized salt) are distinguished.

[a] Average of countries' most recent waves for which indicator is available, weighted by estimated 2015 population size (UNDESA, 2015).

Table A5. Intertemporal comparison of ECD opportunities to be redistributed (Dissimilarity index, initial–final wave %)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. activities	ECCE 3-4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Algeria 2002-2006	7.7-4.6	10.3-14.0	2.3-2.6	2.7-2.8	23.6-.	47.5-.	9.6-14.8	13.5-20.9	9.5-15.3	.-13.2	.-7.2	.-33.4	.-30.1	.-2.9	.-6.5
Comoros 2012	2.3	11.6	6.8	14.0	37.4	30.6	15.0	19.3	13.2	1.9	.	.	.	.	14.6
Djibouti 2006-2012	2.5-6.8	.-12.7	3.0-9.7	8.2-14.8	.	.	12.7-9.7	12.1-13.6	8.5-12.0	.	15.7-14.0	35.1-.	38.2-.	7.1-14.3	23.3-.
Egypt 2005-2008-2014-2015	12.1-9.0-3.3-.	16.6-12.1-5.4-.	10.9-9.0-3.4-.	2.6-1.7-7.2-.	18.1-24.9-21.2-.	20.3-20.4-17.9-.	12.2-9.0-11.5-16.4	15.2-12.1-14.2-34.2	17.1-12.4-8.4-38.9	10.7-8.1-4.1-.	.	25.7-24.1-15.2-27.4	34.3-.-.-.	0.7-.-1.0-.	12.1-.-10.8-.
Iraq 2006-2011	6.4-20.9	11.9-10.1	7.4-2.9	13.4-8.6	11.0-9.7	8.2-6.1	9.1-7.1	6.8-8.5	7.6-7.0	21.9-20.3	10.5-12.6	41.2-43.5	42.2-44.9	4.9-2.6	12.9-17.0
Jordan 2007-2009-2012	0.6-.-0.4	1.5-.-1.8	0.4-.-0.2	3.9-.-2.3	33.6-37.8-19.7	27.8-28.4-20.3	18.9-19.6-24.1	26.3-30.4-27.8	18.8-34.3-24.2	.	.-.-3.4	.-.-24.4	.	.-.-3.5	.
Lebanon 2004-2006	2.6-2.2	.-6.0	.-2.6	18.4-15.9	.	.	22.2-.	21.8-.	23.7-.	2.8-3.2	.	3.5-1.4	.	.	.
Libya 2007	2.0	5.1	0.8	3.0	28.6	23.2	5.1	11.1	9.0	16.1	.	28.4	.	.	25.8
Mauritania 2007-2011	9.5-16.2	.-22.2	25.6-22.3	12.3-17.2	.	.	11.3-14.3	16.6-17.4	16.3-18.2	29.6-25.1	12.0-.	35.5-.	.	.	.
Morocco 2004-2006-2011	14.3-.-11.4	26.6-.-25.7	19.6-.-22.6	3.6-.-7.4	19.5-.-.	20.0-.-.	16.7-.-.	25.0-.-.	25.7-.-.	.-32.2-.	.-15.0-22.2	.-36.7-.	.-32.6-.	.-1.9-.	.-24.6-.
Palestine 2004-2006-2010-2014	0.5-0.5-0.3-0.2	4.3-2.3-1.4-0.8	3.1-0.8-4.3-0.2	1.4-2.6-2.2-3.3	12.4-.-11.2-39.0	13.4-.-11.4-33.8	9.3-13.4-9.8-11.3	11.7-11.4-9.9-19.9	18.2-14.4-10.8-23.2	8.5-1.0-7.1-5.0	.-4.7-6.2-4.0	.-12.2-15.2-14.8	5.7-.-1.5-2.7	.-0.9-1.3-1.4	.-15.7-16.4-.
Somalia 2006-2011	.-25.9	.-24.1	.-30.5	45.2-25.8	12.2-57.5	5.9-52.2	16.5-.	16.6-.	16.7-.	29.4-.	3.9-7.2	46.4-45.0	59.1-24.9	.-3.9	9.6-8.9
Sudan 2006-2010	20.4-18.7	24.4-17.3	16.1-41.6	33.8-15.8	.-89.3	.-86.2	.-14.9	.-14.7	.-9.9	58.1-54.2	.	.-32.3	.-34.5	.	.
Syrian Arab Republic 2006-2009	6.8-5.1	.-8.1	4.3-2.2	7.6-8.6	.	.	12.5-13.0	15.0-13.4	15.2-11.9	.-32.2	10.3-14.0	37.7-41.1	17.2-10.6	2.1-16.4	12.0-31.5
Tunisia 2006-2011	18.7-1.0	10.2-4.7	.-1.1	4.8-4.4	.-40.0	.-36.9	26.0-19.8	38.5-28.1	29.0-24.8	.	17.8-11.8	34.3-25.6	.-6.4	0.9-1.3	.-21.9

Table A5 (*continued*)

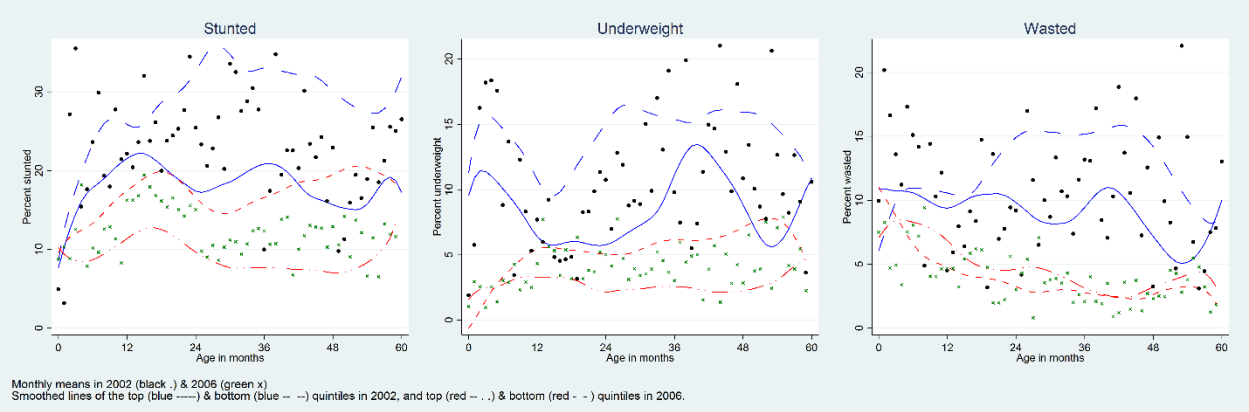
	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. activities	ECCE 3-4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Yemen 2003-2006-2013	17.4-16.8-14.5	25.3-.-32.0	20.6-26.1-22.9	26.1-20.7-14.4	16.4-17.0-19.3	12.5-15.6-16.2	4.9-.-12.3	.-.-13.7	.-.-12.2	.-.-17.4	.-19.3-.	.-54.2-.	.	.-2.7-4.3	.-25.7-.
Wght. avg.[a]	9.6	13.3	12.1	9.1	31.0	31.6	14.6	21.9	21.5	20.5	13.3	46.8	31.4	3.1	16.3

Legend: Initial–intermediate(s)–final. Light green background indicates improvement of values over time; darker red indicates worsening. Among 3+ waves, comparison of the first and the last wave is used. Reported numbers are the percentages of the levels of access to ECD opportunities that should be redistributed to achieve equality of access across evaluated socioeconomic groups. "." unavailable due to missing data, small sample sizes, missing covariates, or perfect collinearity or perfect prediction of outcomes among covariates.

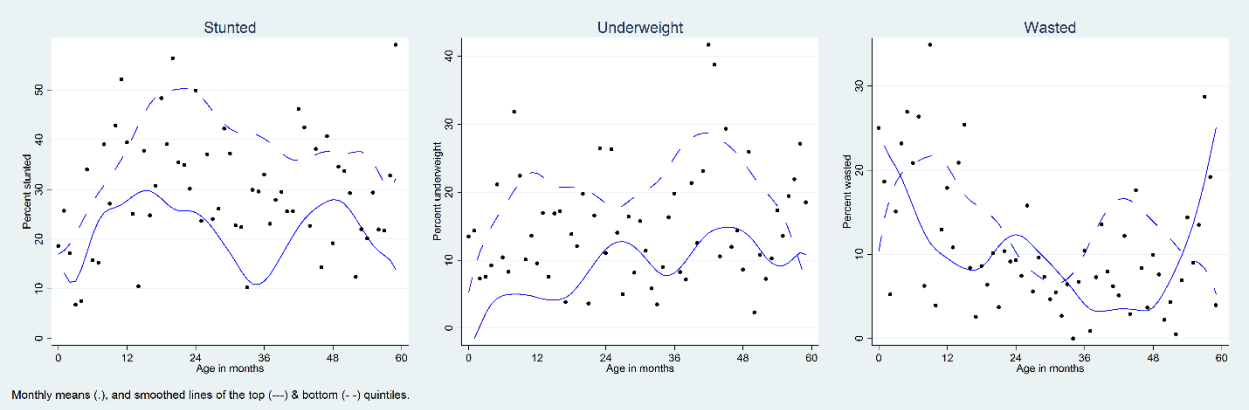
[a] Average of countries' most recent waves for which the indicator is available, weighted by estimated 2015 population size (UNDESA, 2015).

Figure. Children's rates of stunting, underweight and wasting by children's age

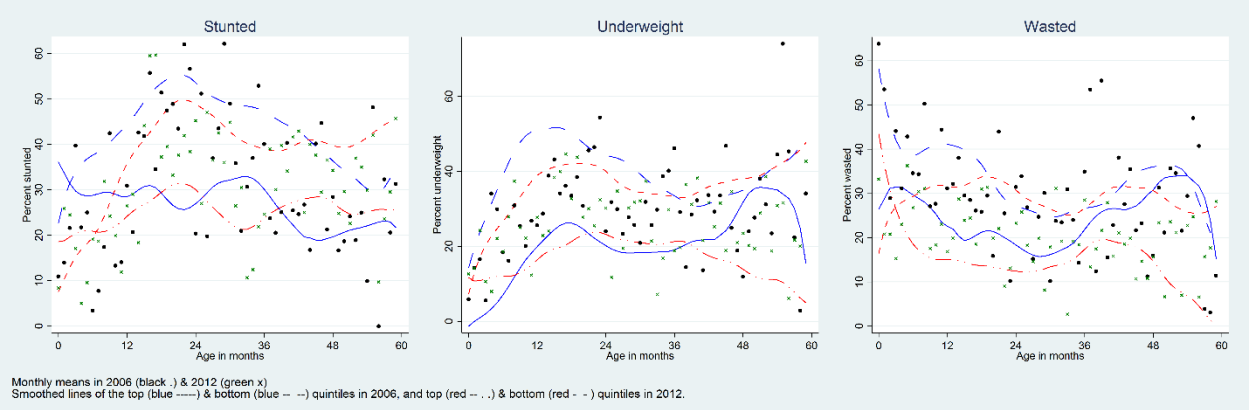
(i) Algeria 2002-2006



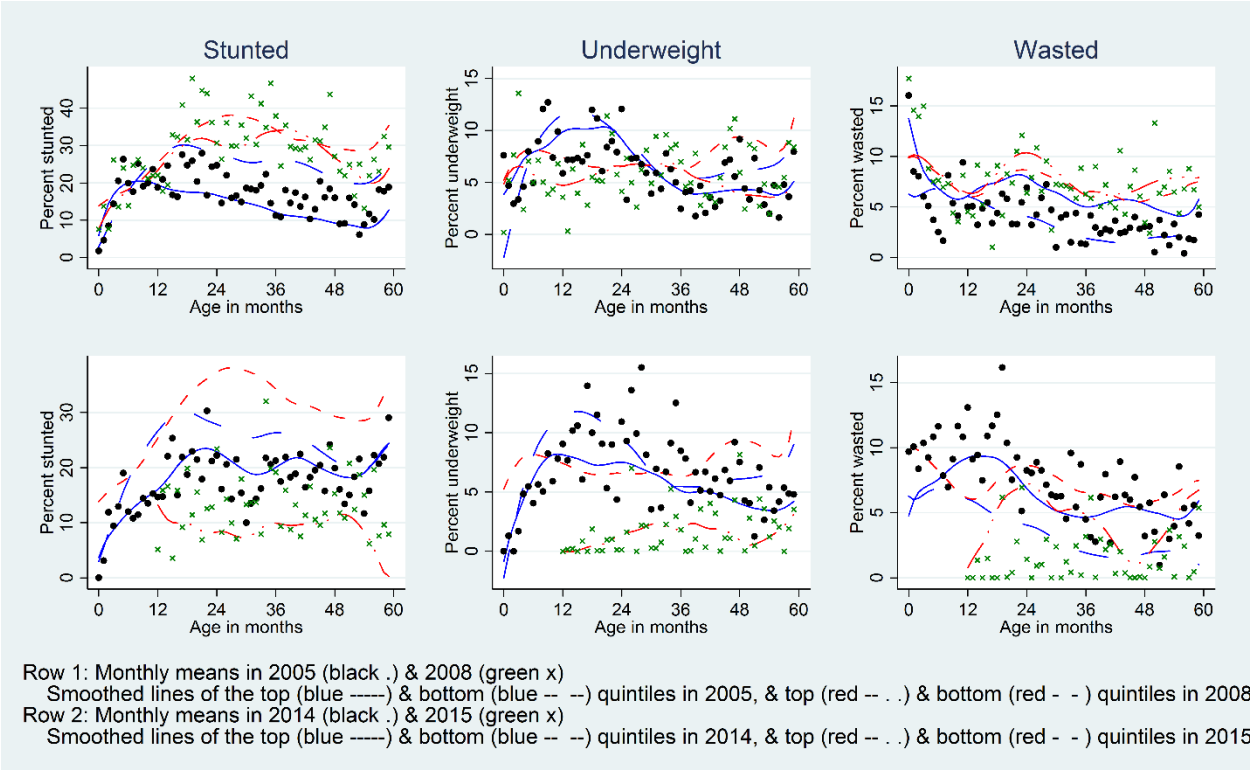
(ii) Comoros 2012



(iii) Djibouti 2006-2012

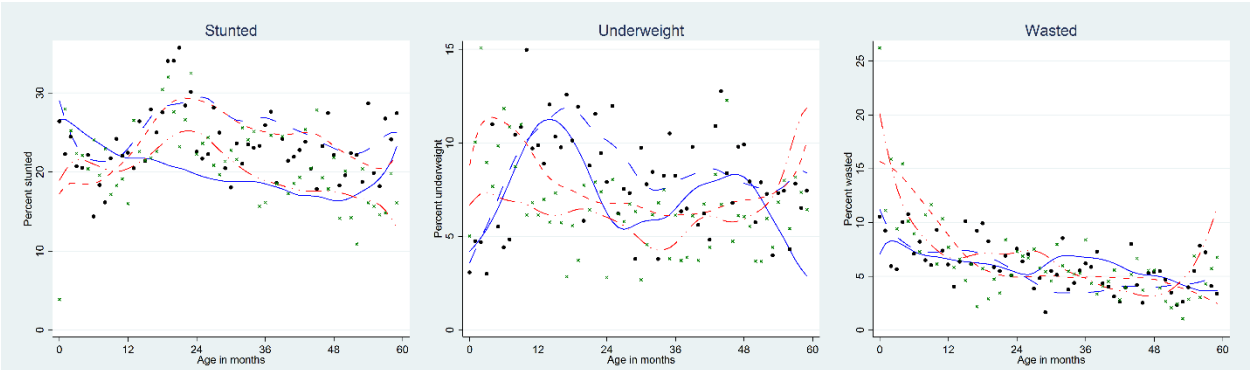


(iv) Egypt 2005-2008-2014-2015



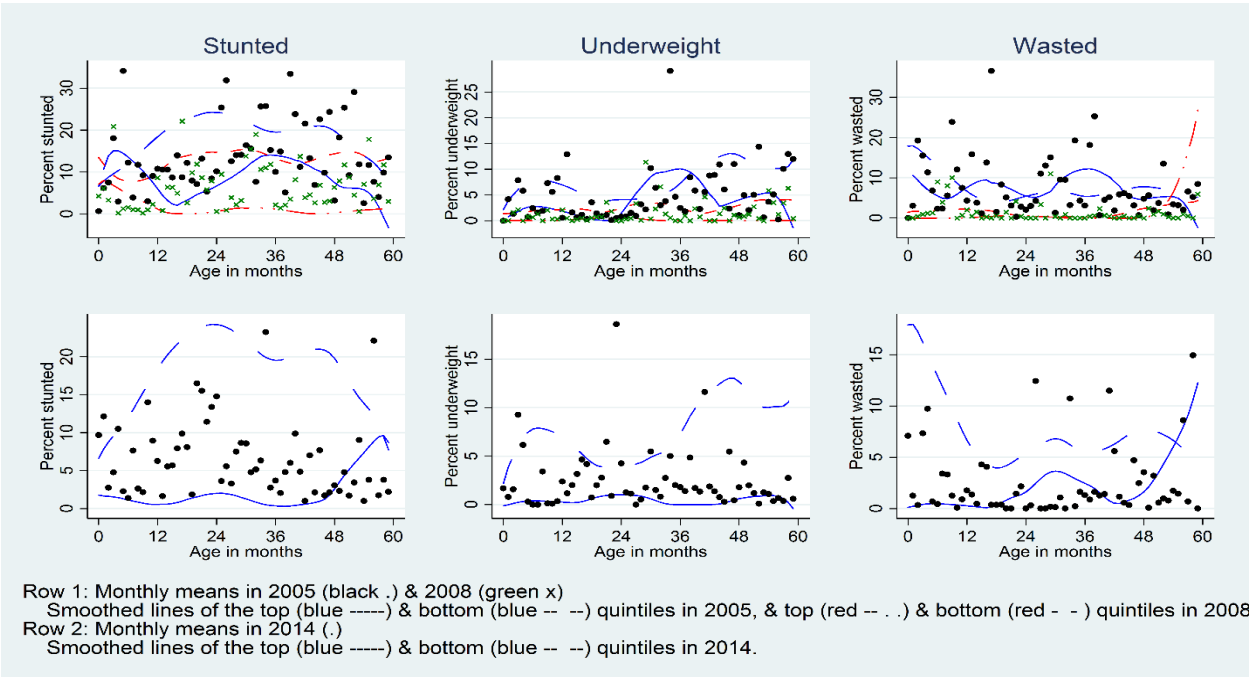
Row 1: Monthly means in 2005 (black .) & 2008 (green x)
Smoothed lines of the top (blue -----) & bottom (blue -- --) quintiles in 2005, & top (red -- . .) & bottom (red - -) quintiles in 2008
Row 2: Monthly means in 2014 (black .) & 2015 (green x)
Smoothed lines of the top (blue -----) & bottom (blue -- --) quintiles in 2014, & top (red -- . .) & bottom (red - -) quintiles in 2015

(v) Iraq 2006-2011



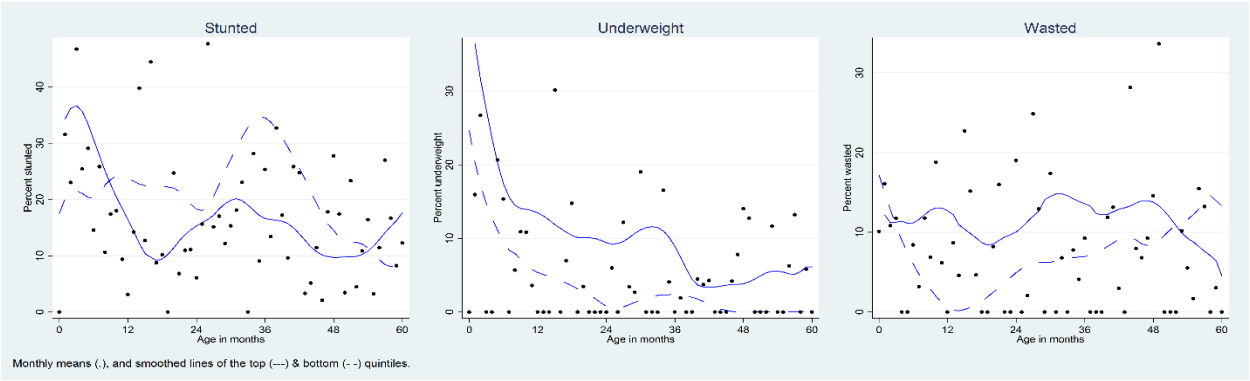
Monthly means in 2006 (black .) & 2011 (green x)
Smoothed lines of the top (blue -----) & bottom (blue -- --) quintiles in 2006, and top (red -- . .) & bottom (red - -) quintiles in 2011.

(vi) Jordan 2005-2008-2014



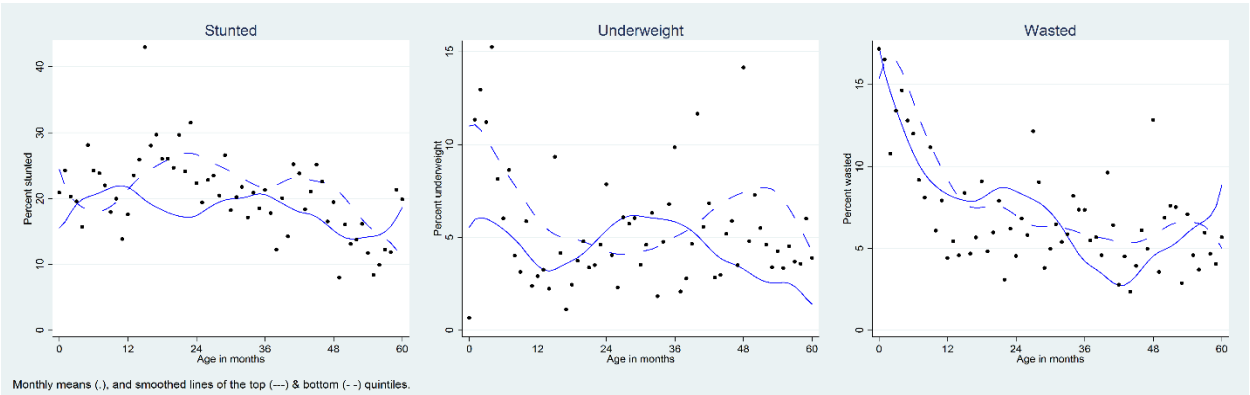
Row 1: Monthly means in 2005 (black .) & 2008 (green x)
Smoothed lines of the top (blue -----) & bottom (blue -- --) quintiles in 2005, & top (red -- . .) & bottom (red - -) quintiles in 2008
Row 2: Monthly means in 2014 (.)
Smoothed lines of the top (blue -----) & bottom (blue -- --) quintiles in 2014.

(vii) Lebanon 2004



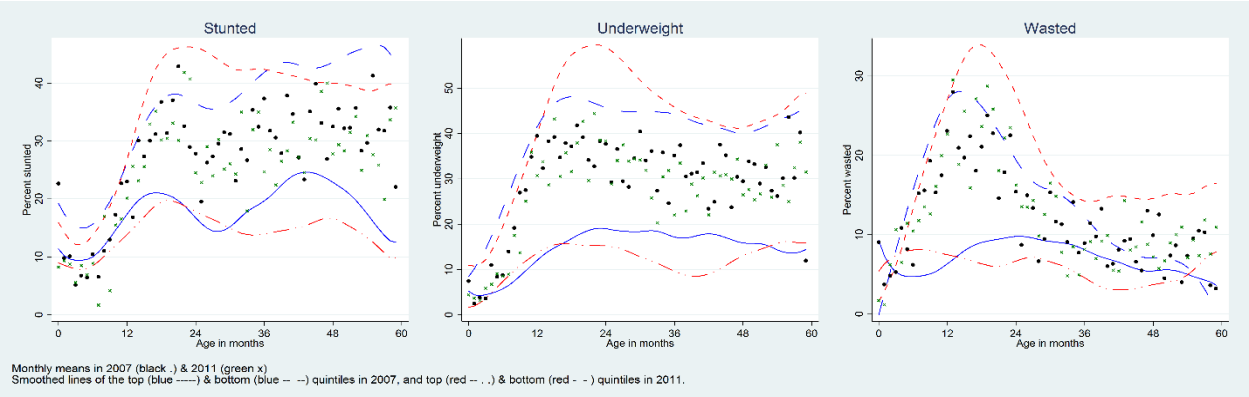
Monthly means (.), and smoothed lines of the top (---) & bottom (- -) quintiles.

(viii) Libya 2007

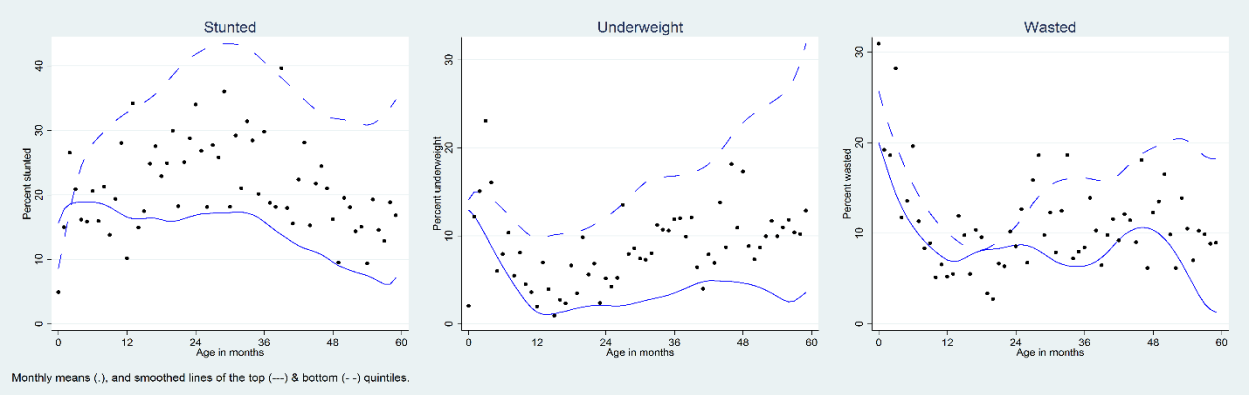


Monthly means (.), and smoothed lines of the top (---) & bottom (- -) quintiles.

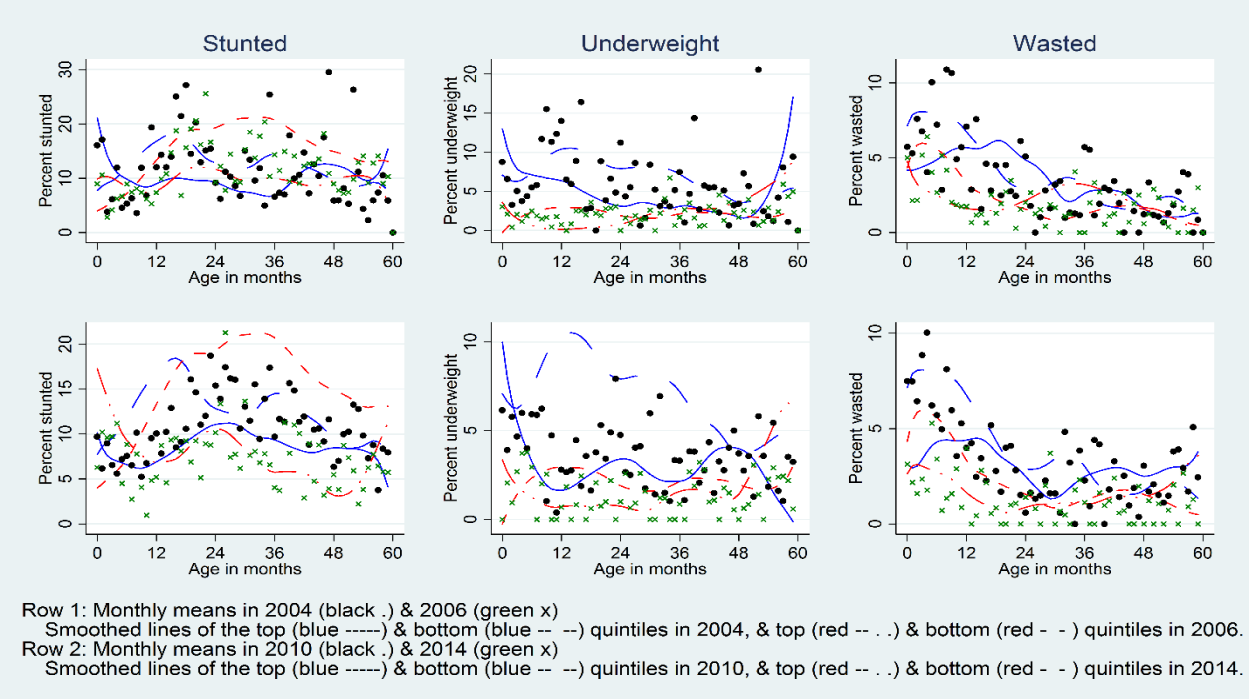
(ix) Mauritania 2007-2011



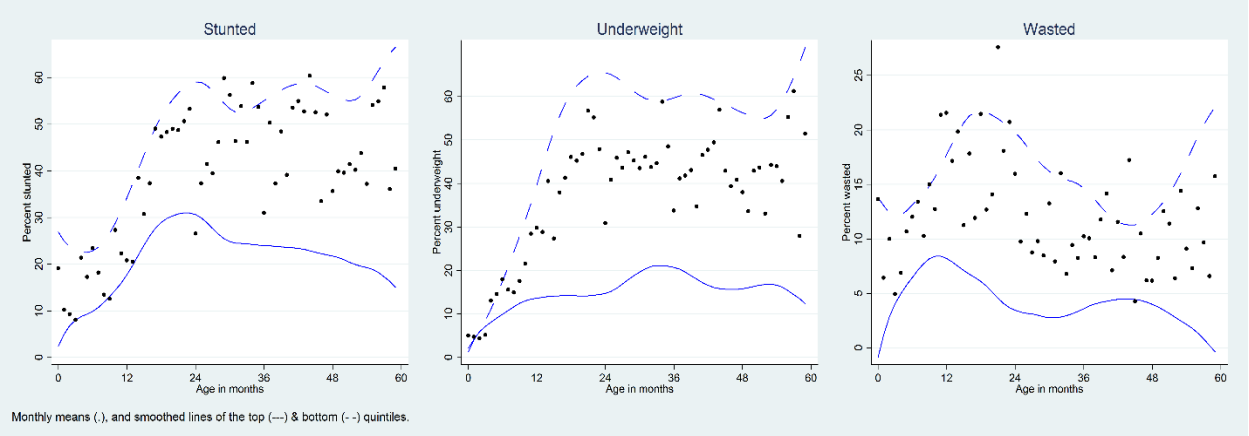
(x) Morocco 2004



(xi) Palestine 2004-2006-2010-2014



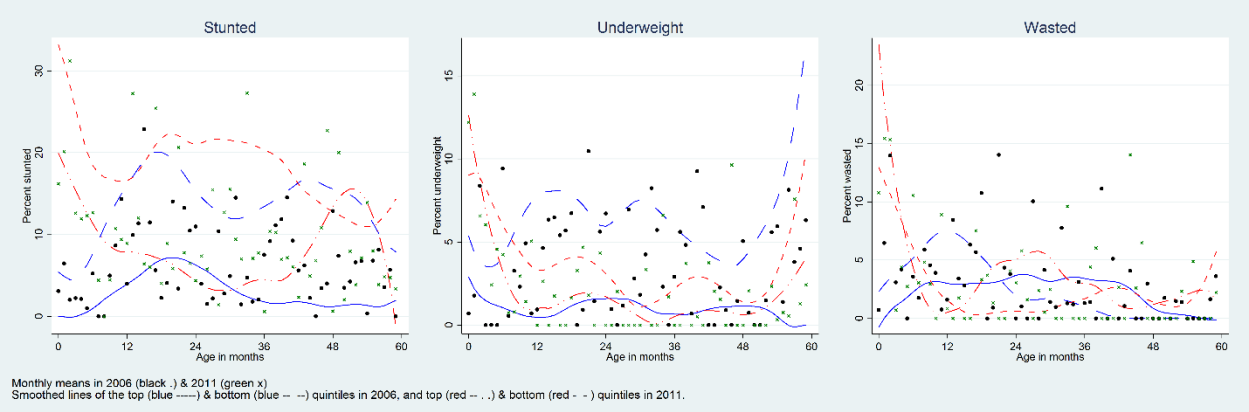
(xii) Somalia 2006



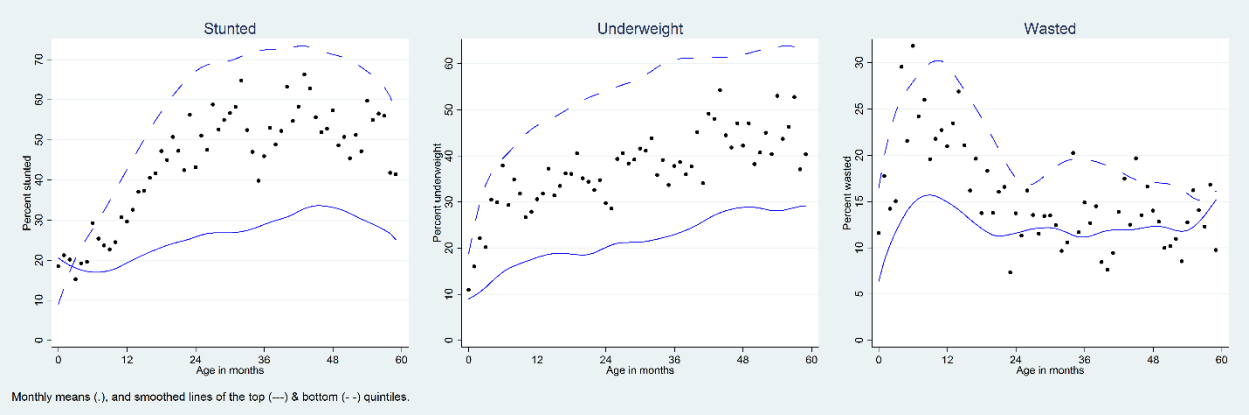
(xiii) Sudan 2010

(xiv) Syrian Arab Republic 2006-2009

(xv) Tunisia 2006-2011



(xvi) Yemen 2013



Each point represents the mean of all observations for a particular month. Fitted lines for the top and bottom wealth-quintiles are lowess-smoothed using a locally-weighted running-line least-squares method.